JEFFERSON

ALHAMBRA

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: MIDDLE FORK WARM SPRINGS **PA#:** 22-046

Date: August 17, 1993 **Time:** 0900

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; rainy (on and off drizzzle); cool (50°F); slight breeze (5 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #15: WR-2 (loadout) and WR-3; #16: WR-4 and quanset. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): The Solar Silver site (22-054) was sampled under this site; the separation was made after the sampling.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Contour, lime, coversoil, and seed dumps; close adits by backfilling, except discharging adits.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MIDDLE FORK WARM SPRINGS **PA#:** 22-046

Legal Description: T 8N ;R 2W ;Sec. 29 , SW1/4SW 1/4 1/4
Sec. 30 , SE1/4SE 1/4 1/4

County: JEFFERSON **Mining District:** ALHAMBRA

Latitude: N 46° 25' 00" **Longitude:** W 111° 53' 48"

Primary Drainage Basin and Code: Warm Springs Creek/10030101
Secondary Drainage Basin: Middle Fork Warm Springs Creek

USGS Quadrangle map name(s): Clancy

Mine Type/Commodities: Hardrock/Unknown

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Public
Owner, Agent, or Contact(Include address and phone when available): Helena National Forest.

Relationship to other mines/sites in the area/district: The Solar Silver site is directly downgradient of this site. There are numerous adits, shafts, and prospects in this drainage.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 5800', Slope 10%, Aspect Northwest

Land use: Mining___, Recreational___, Residential___, Urban___, Agricultural X, Other(Specify)

Area of disturbed/unvegetated lands? Approx. 3 acres.
Dimensions:

Predominant vegetation types: Firs, pines, aspens, willows

Access: roads - good___,poor___,4wd X ,trail___.
Other logistical considerations (proximity to other sites). Road is closed to vehicle traffic at base of site; must come from next drainage over from site.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Several tributaries of the Middle Fork Warm Springs Creek run southeast to northwest through the site. The Middle Fork of Warm springs Creek flows into Warm Springs Creek 2 miles downstream and Warm Springs Creek flows into Prickly Pear Creek approx. 3 1/4 miles downstream. Quartz monzonite boulders are present on the site.

Mining/milling history, ore type/tenor, host rock, gangue: Ore minerals for lode deposits of mines in the same section were described as galena, chalcopyrite, arsenopyrite, and pyrite in a gangue of quartz. The ore contained considerable gold and silver.

Mine Operation?

Shafts - Yes___, No_X_, # ____, Comment

Adits - Yes_X_, No___, # _6_, Comment 1 open

Pits - Yes___, No_X_, # ____, Comment

Placers - Yes___, No_X_, # ____, Comment

Other - Yes___, No_X_, # ____, Comment

Mill Operation? Yes____, No_X_. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

10/29/1993

Well No.	Location	Depth	Yield	Static Water Level
M:57145	08N 02W 32 DC	240.0	15.0	22.00
M:124176	07N 02W 04 BD	83.0	20.0	40.00

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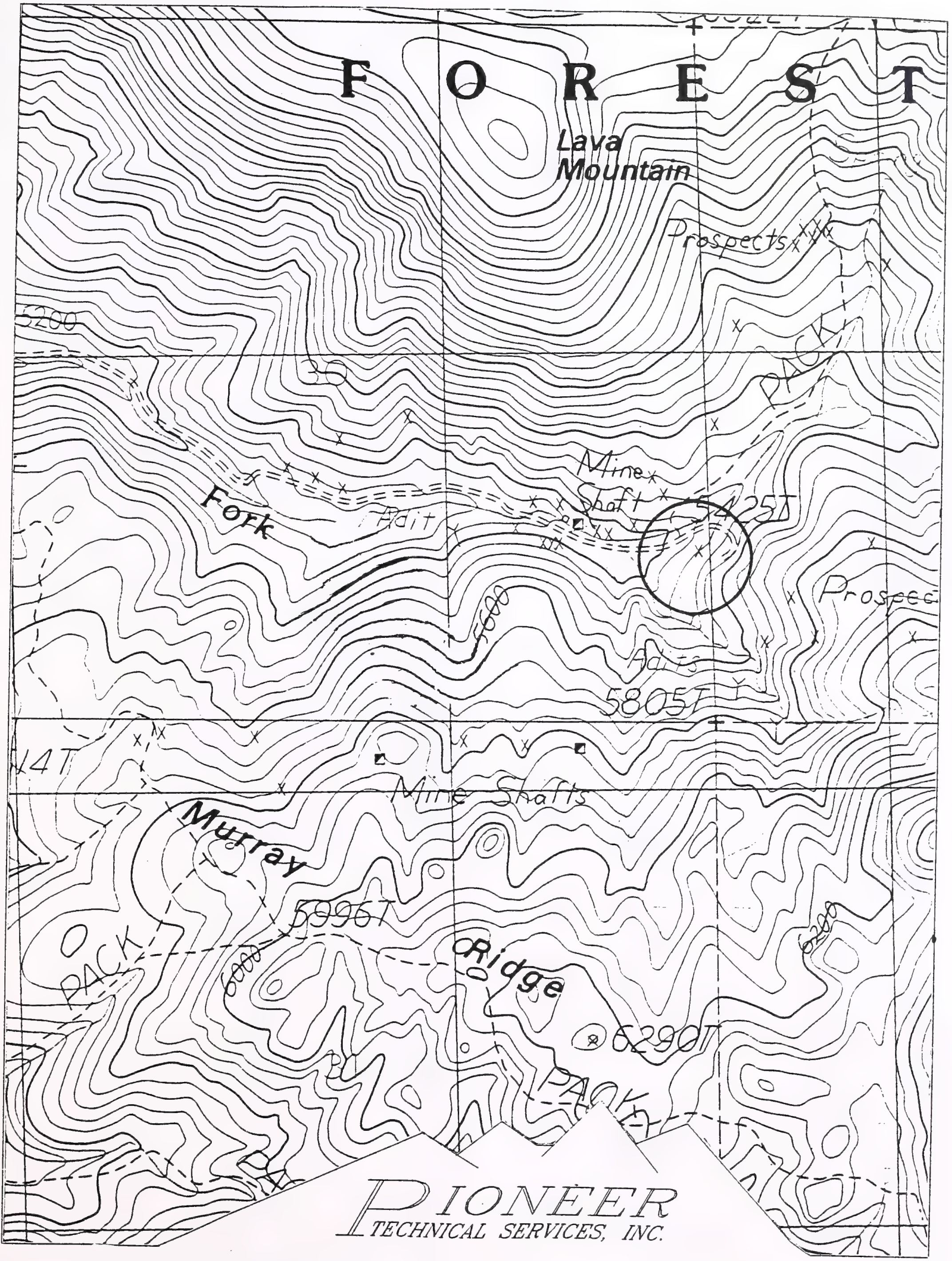
https://archive.org/details/abandonedhardro1994mont_8

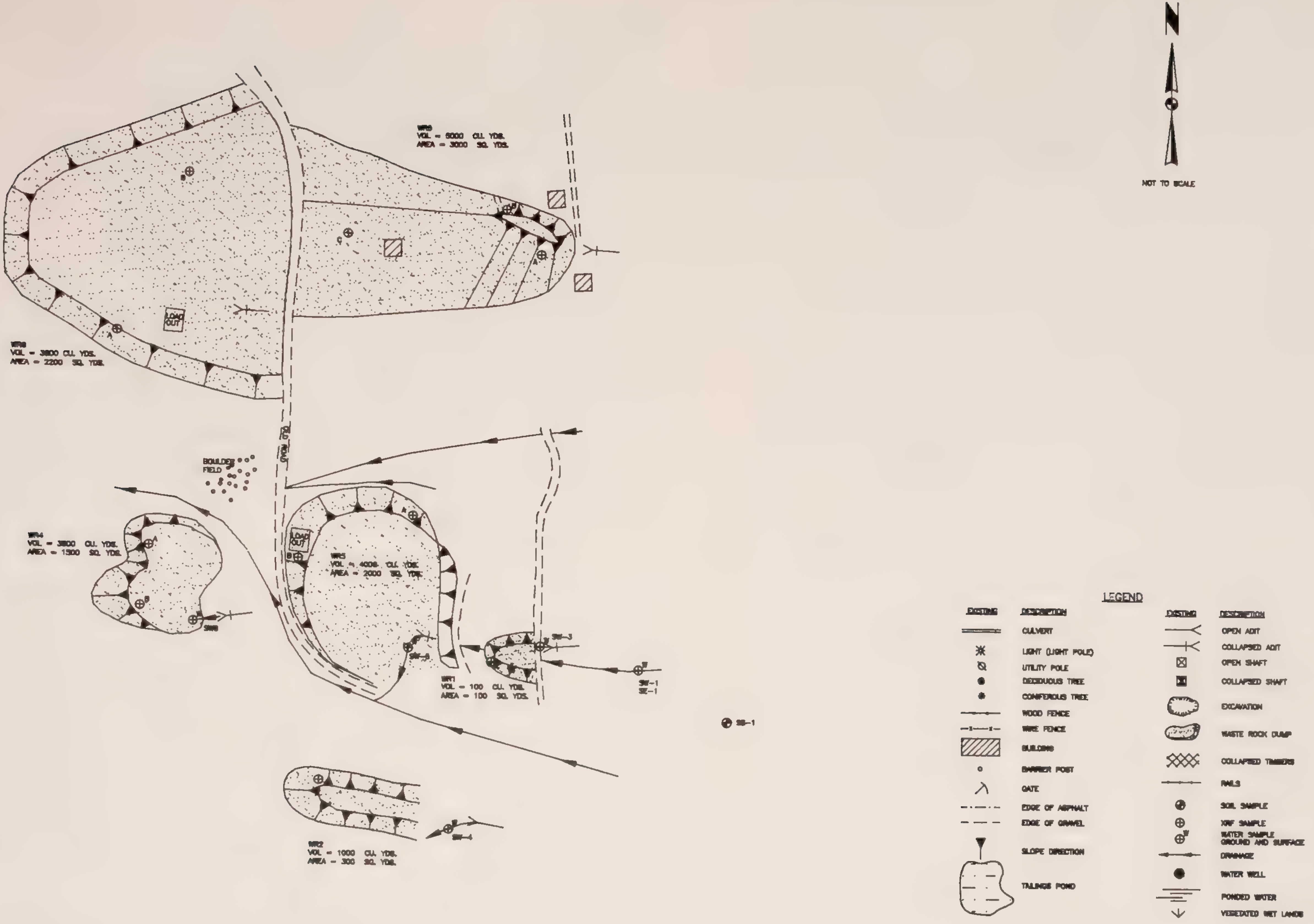


PIONEER
TECHNICAL SERVICES, INC.

MIDDLE FORK WARM SPRINGS, P.A. NO. 22-046

T08N, R02W, SECTIONS 29, 32

SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

MIDDLE FORK WARM SPRINGS PA# 22-046
ALHAMBRA DISTRICT JEFFERSON COUNTY

PIONEER TECHNICAL SERVICES INC. BUTTE, MT.

DRAWN CAJ DATE 12.15.93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

TDH

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

SHEET NO.

22-046.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Flammang, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	100	Off of nose of knob approx. 5'	None	6.4 (D)	0.06	22-046-WR-3	08/18/93 1125	T-Metals, ABA
WR-2	WR	1,000	Just off east side of knob	None	3.85 (D)	0.05			
WR-3A	WR	4,000	On east side of dump about 5' from loadout	None	5.8 (D)	0.08			
WR-3B	WR		10' from west side of loadout; 2' from top	None	6.4 (D)	0.06			
WR-4A	WR	3,800	South side	None	< 3.5 (D)	0.04	22-046-WR-4	08/18/93 1135	T-Metals, ABA
WR-4B	WR		Near drainage on north side	None	3.6 (D)	0.05			
WR-5A	WR	5,000	West of mouth of collapsed adit; 2' after drop off	None	6.3 (D)	0.05	22-046-WR-2	08/18/93 1115	T-Metals, ABA
WR-5B	WR		Below peak of east knob	None	5.65 (D)	0.07	22-046-WR-1	08/18/93 1100	T-Metals, ABA
WR-5C	WR		Approx. 10' southeast of wood structure on south side of drainage	None	4.8 (D)	0.04			
WR-6A	WR	3,800	North side of south pile about 1/2 way down	None	5.8 (D)	0.06			
WR-6B	WR		On north side of drainage off of first level from top	None	5.7 (D)	0.06			
SS-1	BKGRND	N/A	Background soil 50 feet south and east of SW-1	N/A	N/A	N/A	22-046-SS-1	08/17/93 1125	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-046-WR-1 is composite of WR-5B and -5C. 22-046-WR-2 is composite of WR-5A, and WR-6A and -6B. 22-046-WR-3 is composite of WR-1, WR-2, and WR-3A and -3B. 22-046-WR-4 is composite of WR-4A and -4B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes_X_, No___, Number:_4_ Identification:_Adits at WR-1, WR-2, WR-3, and WR-4_

Filled shafts: Yes___, No_X_, Number:____ Identification:____________

Seeps/Springs: Yes_X_, No___, Number:_?_ Identification:_There are many around the site._

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_973_

Distance to nearest well used for drinking?_3 miles to year-round home_

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible_X_, Unlikely____.
Uncontained source containing elevated metal values with shallow groundwater.

Other observations/notes:_N/A_

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-3	AD	Adit discharge at WR-1	< 1 gpm (E)	7.14	109	116	NM	39	N/A	N/A	N/A	Field Parameters
SW-4	AD	Adit discharge at WR-2	< 1 gpm (E)	6.61	221	361	NM	21	N/A	N/A	N/A	Field Parameters
SW-5	AD	Adit discharge at WR-3	< 1 gpm (E)	6.72	333	NM	NM	NM	N/A	N/A	N/A	Field Parameters
SW-6	AD	Adit discharge at WR-4	< 1 gpm (E)	7.16	335	NM	NM	NM	N/A	N/A	N/A	Field Parameters

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No ___, Name(s): Unnamed tributaries to Middle Fork Warm Springs

Dry streambeds: Yes ___, No X , Name(s): ___

Other surface water: Yes ___, No X , Name(s)/Description: ___

Waste materials within any floodplain: Yes X , No ___ Source ID(s): All waste rock piles are in floodplain.

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 50 gpm during sampling
High Flow: 500 gpm , Average Flow: 60 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X , No ___,
Describe: Unnamed tributaries of Middle Fork Warm Springs

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, fishery, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes X , No ___, Distance downstream (ft)? 50 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Solar Silver Mine is immediately below WR-6; waste rock is eroding into the creek.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as CaCo$_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	200' upgradient on unnamed tributary of Middle Fork Warm Springs from WR-1	5.67	106	122	NM	47	15 gpm (E)	22-046-SW-1	08/17/93 1145	T-Metals, TDS, Hardness, Cl-, SO4, NO2/NO3
SE-1	SE	200' upgradient on unnamed tributary of Middle Fork Warm Springs from WR-1	N/A	N/A	N/A	N/A	N/A	N/A	22-046-SE-1	08/17/93 1145	T-Metals
SW-2	SW	Downgradient 150' below Solar Silver on unnamed tributary to Middle Fork Warm Springs	7.68	196	187	NM	56	50 gpm (E)	22-046-SW-2	08/17/93 1405	T-Metals, TDS, Hardness, Cl-, SO4, NO2/NO3
SE-2	SE	Downgradient 150' below Solar Silver on unnamed tributary to Middle Fork Warm Springs	N/A	N/A	N/A	N/A	N/A	N/A	22-046-SE-2	08/17/93 1405	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Downgradient SW and SE collected and submitted with Solar Silver site.

NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
$pH \leq 5.0$	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes X **, No** ___ **, Describe:** Between waste rock dumps along sides

Carbonate rocks/soils: Yes X **, No** ___ **, Describe:** Some limestone

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ___ **; 10-30** ___ **; 30-100** X **; 100-300** ___ **; 300-1,000** ___ **; 1,000-3,000** ___ **; 3,000-10,000** ___ **; 10,000 or greater** ___ **; Comments** ___

Nearest residence(ft or miles)? 3 miles to nearest full-time residence; Forest Service cabin at base of stream.

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammang, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3	Dry	900	900	Yes	Low
WR-2	SO3; pH	Dry	2,700	2,700	Yes	Low
WR-3	SO3	Dry	18,000	18,000	Yes	Low
WR-4	SO3; pH	Dry	13,500	13,500	Yes	Low
WR-5	SO3; pH	Dry	27,000	27,000	Yes	Low
WR-6	SO3	Dry	19,800	17,820	Yes	Low
SW-3	Moss	N/A	N/A	N/A	N/A	N/A
SW-5	Long algae	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications: Stressed vegetation on WR-3 and WR-6.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:____________________

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments____________________

Evidence of recreational use on site: Yes_X_, No___, Describe: Campfire ring on WR-4

Accessibility - Fences, warning signs, closed roads? Road is closed; Fish, Wildlife, and Parks sign

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment____________
Wilderness Area - Yes___, No_X_, Comment____________
T&E Species Habitat - Yes___, No_X_, Comment____________
Bat Habitat - Yes_X_, No___, Comment Open adit

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1_, types and locations: Adit #2

Hazardous structures: Yes_X_, No___, Number_3_, types and locations: Loadout on WR-3; building on WR-4; and, track supports on WR-2.

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:____________________

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_2_, types and locations: Unstable waste pile on WR-5 near WR-5B hole; south side of WR-6 has unstable waste pile (WR-6A).

Fire and/or Explosion hazards: Yes_X_, No___, Explain: Loadout on WR-3; building on WR-4 (wood structures)

Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Middle Fork Warm Springs, Prepared by Chen-Northern, August 12, 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Middle Fork Warm Springs, Prepared by Delta Engineering, Date Unknown.

USGS, Topographic Map, Clancy, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

MIDDLE FORK WARM SPRINGS
PA NO. 22-046

Middle Fork Warm Springs PA# 22-046
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils — Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-046-SE-1	7.43 J	23 J	0.6 U	5.53	3.63	12.6	9220	0.031 U	223	4.51	9.5 U	7.21 U	28.4 J	NR
22-046-SE-2	1130 J	37.9 J	14.7 J	13.4	15.8	115	32500	0.206	814	7.71	263 J	7.59 U	1610 J	NR
22-046-WR-1	5540 J	14.2 J	0.7 J	2.17 U	1.53 U	63.4	24100	0.08	41.4	2.83 U	992 J	6.86 U	188 J	NR
22-046-WR-2	3010 J	12.9 J	0.5 U	3.5	1.38 U	114	30100	0.189	295	2.55 U	2450 J	6.18 U	523 J	NR
22-046-WR-3	4290 J	9.29 J	5.0 J	1.86 U	1.61	93.8	30400	0.273	453	2.43 U	1890 J	5.89 U	1350 J	NR
22-046-WR-4	24000 J	8.4 J	7.3 J	10.9	3.55	252	68600	0.027 U	1200	7.77	2550 J	6.07 U	1100 J	NR
BACKGROUND	32.1 J	77.7 J	0.9 J	14.1	16.8	29.2	27200	0.03 U	587	9.28	52.7 J	5.46 U	116 J	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-046-WR-1	0.25	7.81	-6.12	-13.9	0.24	<0.01	0.01	0.00	-6.12
22-046-WR-2	0.74	23.1	-1.81	-24.9	0.66	0.02	0.06	0.62	-2.44
22-046-WR-3	1.19	37.2	7.71	-29.5	0.56	0.25	0.38	7.81	-0.10
22-046-WR-4	6.65	208	10.4	-197	1.60	1.59	3.46	49.7	-39.2

WATER MATRIX ANALYSES

Metals in Water — Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-046-SW-1	2.5	6.17	2.57 U	9.7 U	6.83 U	1.77 J	67.5	0.25 J	6.07	12.7 U	0.72 U	30.7 U	13.3	28.1
22-046-SW-2	23.1	8.27	8.27 J	9.7 U	6.83 U	12.8 J	337	0.21 J	317	12.7 U	2.22	30.7 U	1290	101

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry — Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-046-SW-1	81	< 5.0	9	< 0.05	NR
22-046-SW-2	176	< 5.0	61	< 0.05	NR

LEGEND

SE1 - Upgradient (200') on unnamed tributary of Middle Fork Warm Springs.
SE2 - Downgradient (150') on unnamed tributary of Middle Fork Warm Springs.
WR1 - Composite of subsamples WR5B and 5C.
WR2 - Composite of subsamples WR5A, 6A, and 6B.
WR3 - Composite of subsamples WR1, 2, 3A, and 3B.
WR4 - Composite of subsample WR4A and 4B.
BACKGROUND - 50 feet South and East of SW-1
SW1 - Same as sample SE1.
SW2 - Same as sample SE2.

XRF ANALYSIS RESULTS

MIDDLE FORK WARM SPRINGS
PA NO. 22-046

MDSL AMRB/PIONEER 4/9/93

Mine Name: Middle Fork Warm Springs PA# 22-046
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-046-WR3-A		18542.3	2655.98	1371.48			55963.4		70.2281 *	793.875	7298.05	105.072
22-046-WR3-B		18334.5	6666.21	1542.66		714.183 *	14450.6			310.834	44.4195 *	115.556
22-046-WR4-A		17178.2	7717.2	1677.08			59174.9		176.83 *	656.6	14804.2	124.047
22-046-WR4-B		20625.5	10933.2	1511.34		1978.37	45044.8		225.909	871.632	9958.47	109.228
22-046-WR5-A		17129.8	14690.5	1551.93		789.83 *	54289.7		145.492 *	643.19	2636.23	97.8744
22-046-WR5-B		15498.6	4488.41	795.839			23142.4		85.7237 *	264.906	4168.49	66.5891
22-046-WR5-B-DUP		13727.5	4225.07	744.508			24199.6		96.8927 *	241.334	4205.88	60.9764
22-046-WR5-C		21083	2472.19	1822.24			44877.3		72.902 *	257.119	8700.53	115.434
22-046-WR6-A		25232.6	1821.71	1632.94			30199.7		158.826 *	149.578 *	3201.06	57.0689
22-046-WR6-B		17619.5	11492	1041.47			23962.9		78.2656 *	222.551	1394.26	95.6849
22-046-WR-1		14326	12684.6	1266.49		2962.88	34294		194.044 *	5937.95	1445.36	101.62
22-046-WR-1-COMP		17523.6	3067.88	1117.39			36733.3		56.9129 *	228.405	6697.56	101.299
22-046-WR-2		21180.1	6683	1508.32			51346.8		261.387	294.259	11707.7	127.224
22-046-WR-2-COMP		22570.2	9049.94	1671.23			33502.8		72.0353 *	267.635	1966.46	93.9862
22-046-WR-3-COMP		19277.1	5363.12	1205.94		856.268 *	43625.9		121.927 *	1453.93	6130.82	105.115
22-046-WR-4-COMP		18011.5	11848.4	1303.28		1678.59	46277		117.648 *	573.828	9307.52	85.2787

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-046-WR3-A	121.063		13.3176 *	2467.18	205.964			203.485	113.146 *		23.4946 *
22-046-WR3-B	97.7054			212.226	214.103			275.365		31.5238 *	43.5514
22-046-WR4-A	90.2486			1781.11	176.025			254.503	112.722 *	13.5824 *	11.9044 *
22-046-WR4-B	115.053			558.678	230.923			281.825		14.9096 *	19.3225 *
22-046-WR5-A	135.711			1278.99	201.248			318.547			17.7548 *
22-046-WR5-B	212.181			762.064	184.687	115.727 *		113.236		81.0029	102.819
22-046-WR5-B-DUP	205.146			880.691	184.864			96.1386		90.2076	106.605
22-046-WR5-C	186.134			953.529	255.259			242.806		30.8504 *	35.0984
22-046-WR6-A	162.93		21.9892	2938.03	275.931			174.541	120.314 *	19.097 *	31.8663 *
22-046-WR6-B	195.25			1749.42	418.32			153.292		64.3763	82.2056
22-046-WR-1	110.396			2180	139.831			307.414	121.398 *	12.7316 *	22.9517 *
22-046-WR-1-COMP	193.585			772.008	229.219			205.847	74.071 *	42.0428 *	49.8253
22-046-WR-2	168.186		29.2827	1620.87	197.111			355.119	116.291 *		17.366 *
22-046-WR-2-COMP	168.427		7.53456 *	1881.28	264.35			201.165	87.7563 *		20.0833 *
22-046-WR-3-COMP	144.711		9.71253 *	2651.17	216.163			266.737	94.0554 *		
22-046-WR-4-COMP	141.344			1106.36	164.269			171.567	105.229 *		

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

MIDDLE FORK WARM SPRINGS
PA NO. 22-046

AIMSS SCORESHEET

SITE NAME: MIDDLE FK WARM SPGS
PA NUMBER: 22-046

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	133.199
6	GW - TARGETS	WELLS - 1 MI. x 2.5		5.0
7		WELLS - 1 TO 4 MI		45
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	50.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	2663980

SURFACE WATER PATHWAY

LINE NO.				
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	135.777
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	1955189

AIR PATHWAY

LINE NO.				
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.526
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	40
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	9052

DIRECT CONTACT PATHWAY

LINE NO.				
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.440
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 - 42	6
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	2664

45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000	**46.31**

SITE NAME: MIDDLE FK WARM SPGS
PA NUMBER: 22-046

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	120
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	170
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	6
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**10.20**

SUMMARY OF HISTORICAL ANALYTICAL DATA FROM OTHER SOURCES

t Name: CHEN-NORTHERN, INC. HELENA, MT
ject No.: 87-911
roject Name: AMR RIT Sampling

July 19, 1991
Sheet 3 of 5

Laboratory No.: 116946
Sample Name: WARM SPRINGS MINE
Sample Date: 05/31/91
Collected by: MICHAEL CORMIER
Time Sampled: None Given

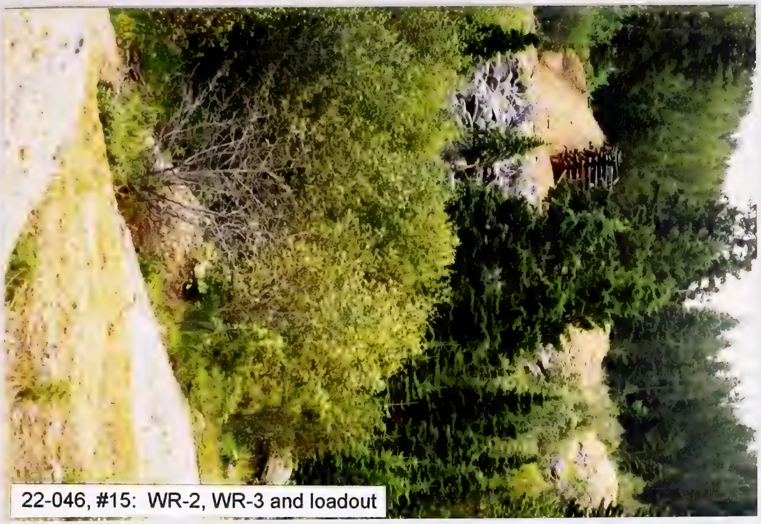
PARAMETER	AVERAGE VALUE	
INORGANICS:		
Electrical Conductivity	3.5	mmhos/cm
pH	5.8	S.U.
METALS:		
Arsenic as As (Dissolved) Saturated Paste Extract	0.210	mg/l
Arsenic as As (Total) Dry Basis	9300	mg/kg
Cadmium as Cd (Dissolved) Saturated Paste Extract	0.06	mg/l
Cadmium as Cd (Total) Dry Basis	36.1	mg/kg
Chromium as Cr (Dissolved) Saturated Paste Extract	0.13	mg/l
Chromium as Cr (Total) Dry Basis	19.1	mg/kg
Lead as Pb (Dissolved) Saturated Paste Extract	0.12	mg/l
Lead as Pb (Total) Dry Basis	1950	mg/kg
Mercury as Hg (Total) Dry Basis	<0.2	mg/kg
TCLP METALS:		
Arsenic TCLP	1.7	mg/l
Cadmium TCLP	0.075	mg/l
Chromium TCLP	<0.02	mg/l
Lead TCLP	0.82	mg/l
Mercury TCLP	<0.0016	mg/l

nt Name: CHEN-NORTHERN, INC. HELENA, MT
ject No.: 87-911
oject Name: AMR RIT Sampling

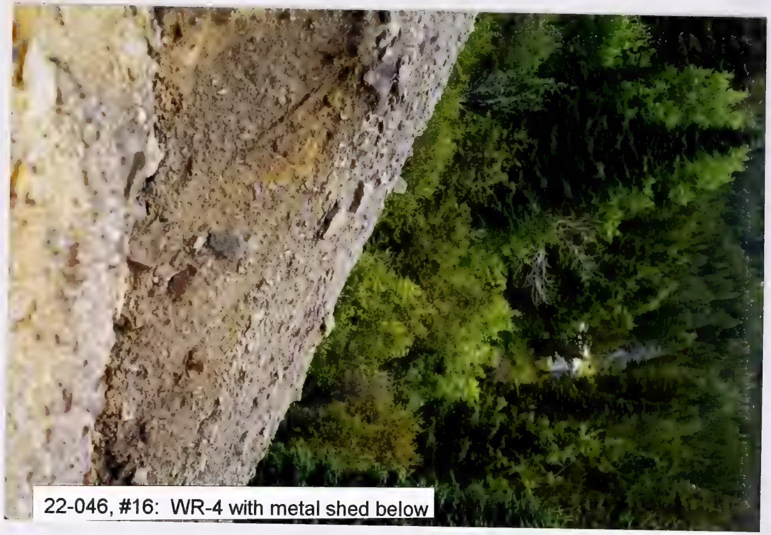
July 19, 1991
Sheet 2 of 5

Laboratory No.: 116945
Sample Name: WARM SPRINGS TAILS
Sample Date: 05/31/91
Collected by: MICHAEL CORMIER
Time Sampled: None Given

PARAMETER	AVERAGE VALUE	
INORGANICS:		
Electrical Conductivity	4.5	mmhos/cm
pH	3.8	S.U.
METALS:		
Arsenic as As (Dissolved) Saturated Paste Extract	0.108	mg/l
Arsenic as As (Total) Dry Basis	2400	mg/kg
Cadmium as Cd (Dissolved) Saturated Paste Extract	1.94	mg/l
Cadmium as Cd (Total) Dry Basis	15.6	mg/kg
Chromium as Cr (Dissolved) Saturated Paste Extract	0.02	mg/l
Chromium as Cr (Total) Dry Basis	26	mg/kg
Lead as Pb (Dissolved) Saturated Paste Extract	0.40	mg/l
Lead as Pb (Total) Dry Basis	663	mg/kg
Mercury as Hg (Total) Dry Basis	<0.2	mg/kg
TCLP METALS:		
Arsenic TCLP	<0.5	mg/l
Cadmium TCLP	0.051	mg/l
Chromium TCLP	<0.02	mg/l
Lead TCLP	0.06	mg/l
Mercury TCLP	<0.0016	mg/l



22-046, #15: WR-2, WR-3 and loadout



22-046, #16: WR-4 with metal shed below

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: ALHAMBRA HOT SPRINGS **PA#:** 22-049

Date: August 17, 1993 **Time:** 1800

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Warm (70°F); cloudy, with occasional slight rain; calm; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** #18: WR-1; #19: WR-2. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** A house located immediately below the fenced shaft appears to be a child care facility. Childrens' toys are scattered over the hillside near the shaft and adit dump.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Finish filling adit cut to prevent falls; put more topsoil on WR-1 to further isolate metals from direct contact.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ALHAMBRA HOT SPRINGS PA#: 22-049

Legal Description: T 8N ;R 3W ;Sec. 16 , NW1/4 NE1/4 ___1/4

County: JEFFERSON Mining District: ALHAMBRA

Latitude: N 46° 27' 05" Longitude: W 111° 59' 02"

Primary Drainage Basin and Code: Prickly Pear Creek/10030101
Secondary Drainage Basin: Warm Springs Creek

USGS Quadrangle map name(s): Clancy

Mine Type/Commodities: Hardrock/Gravel

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Mabel Bompart, Route 2 Box 1, Clancy, MT 59634; David Carlson, Box 417 Star Route, Clancy, MT 59634. (406) 933-5772; Hillbrook Nursing Home, Route 2, Clancy, MT 59634. (406) 933-8311; Helena National Forest.

Relationship to other mines/sites in the area/district: Other mines are up Warm Springs Creek.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? A shaft has been covered by MDSL with a grate; a second shaft has been completely filled. Dirt has been dumped over the adit.

General site features: Elevation 4400' , Slope 5%-15% ,
Aspect Southwest

Land use: Mining___, Recreational___, Residential X , Urban___,
Agricultural___, Other(Specify)___

Area of disturbed/unvegetated lands? 0.25 acres.
Dimensions:___

Predominant vegetation types: Ponderosa pine with virtually no undergrowth.

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites). At the beginning of the road leading to Middle Fork Warm Springs site.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 126 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Bedrock is mainly quartz monzonite in the Alhambra Warm Springs District. Site lies on north side of Warm Springs Creek just before its confluence with Prickly Pear Creek. Warm Spring Creek flows west below the site, which lies approx. 750 feet above the creek.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?
Shafts - Yes X, No ___, # 1, Comment Grated
Adits - Yes X, No ___, # 1, Comment Blocked by dirt
Pits - Yes ___, No X, # ___, Comment
Placers - Yes ___, No X, # ___, Comment
Other - Yes ___, No X, # ___, Comment

Mill Operation? Yes ___, No X. If yes answer the next three questions:

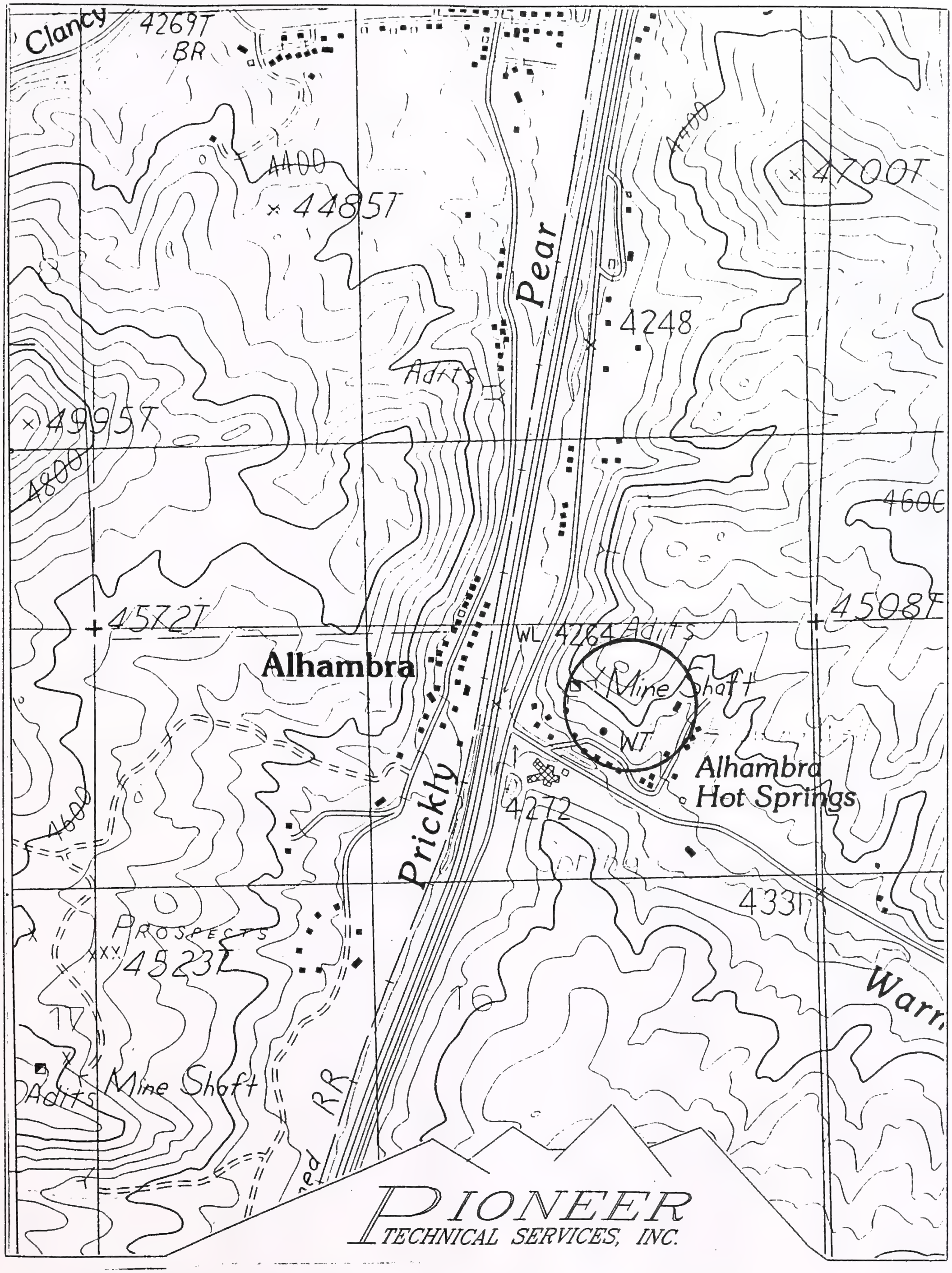
Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A

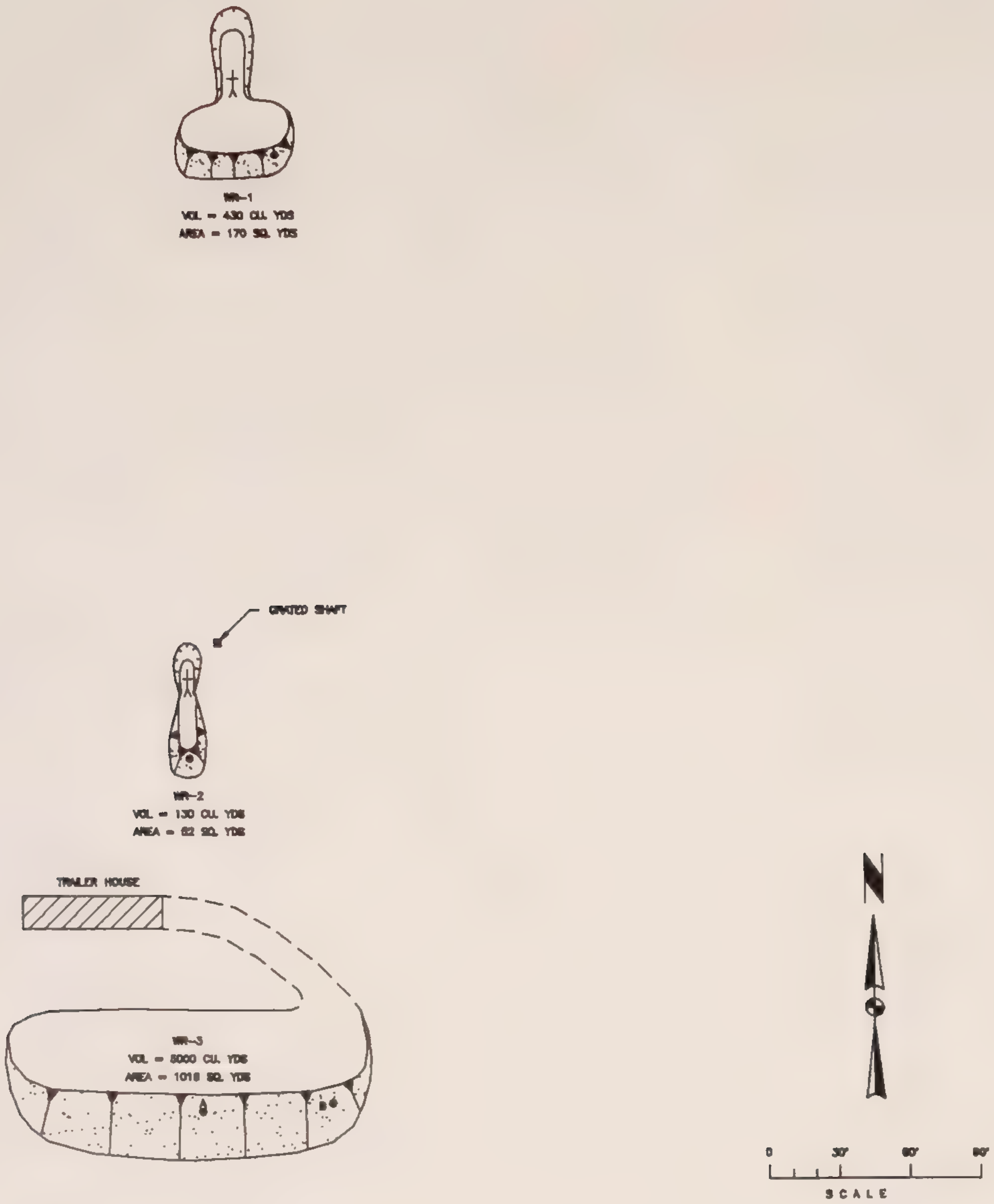
Well No.	Location	Depth	Yield	Static Water Level
M:57180	08N 03W 08 AAC	55.0	25.0	40.00
M:125263	08N 03W 08 DAC	181.0	8.5	39.00
M:57182	08N 03W 09	150.0	50.0	35.00
M:57189	08N 03W 09	18.0	5.0	0.00
M:57190	08N 03W 09	35.0	20.0	12.00
M:57194	08N 03W 09	21.0	20.0	8.00
M:57196	08N 03W 09	150.0	10.0	15.00
M:57198	08N 03W 09	310.0	30.0	26.00
M:130185	08N 03W 09	23.0	12.0	7.00
M:57186	08N 03W 09	14.0	10.0	0.00
M:57188	08N 03W 09	18.0	30.0	0.00
M:57191	08N 03W 09	0.0	50.0	0.00
M:57184	08N 03W 09	18.0	30.0	0.00
M:57195	08N 03W 09	125.0	6.0	30.00
M:57187	08N 03W 09	14.0	10.0	0.00
M:57197	08N 03W 09	420.0	8.0	10.00
M:57183	08N 03W 09	0.0	0.0	0.00
M:57193	08N 03W 09	166.0	4.0	60.00
M:57185	08N 03W 09	23.5	8.0	5.00
M:57181	08N 03W 09	167.0	30.0	Flowing
M:57192	08N 03W 09	0.0	75.0	0.00
M:57200	08N 03W 09 A	48.0	12.0	8.00
M:57199	08N 03W 09 A	20.0	20.0	6.00
M:57202	08N 03W 09 AA	38.0	12.0	6.00
57203	08N 03W 09 AA	120.0	15.0	10.00
57201	08N 03W 09 AA	0.0	50.0	20.00
M:128022	08N 03W 09 AAA	345.0	6.0	62.00
M:57204	08N 03W 09 AAA	40.0	20.0	12.00
M:57205	08N 03W 09 AACB	50.0	0.0	0.00
M:57206	08N 03W 09 AACB	15.0	0.0	0.00
M:57207	08N 03W 09 AACB	12.0	0.0	0.00
M:57208	08N 03W 09 AACB	6.0	0.0	6.00
M:57210	08N 03W 09 AAD	24.0	13.0	8.00
M:57209	08N 03W 09 AAD	61.0	3.0	10.00
M:57211	08N 03W 09 AB	34.0	20.0	7.00
M:120390	08N 03W 09 AB	280.0	15.0	50.00
M:121008	08N 03W 09 AC	100.0	30.0	30.00
M:57212	08N 03W 09 ACB	40.0	10.0	4.00
M:57213	08N 03W 09 ACC	240.0	6.0	30.00
M:57215	08N 03W 09 B	265.0	20.0	50.00
M:57214	08N 03W 09 B	105.0	15.0	18.00
M:57217	08N 03W 09 BA	46.0	20.0	23.00
M:57216	08N 03W 09 BA	38.0	20.0	8.00
M:57218	08N 03W 09 BB	78.0	12.0	22.00
M:129336	08N 03W 09 BB	45.0	12.0	12.00
M:57219	08N 03W 09 BD	170.0	35.0	30.00
M:129338	08N 03W 09 BD	145.0	25.0	8.00
M:57220	08N 03W 09 BDC	480.0	6.0	40.00
M:57221	08N 03W 09 C	34.0	20.0	14.00
57222	08N 03W 09 C	23.0	15.0	13.00
57223	08N 03W 09 CA	32.0	30.0	15.00
M:57224	08N 03W 09 CBDB	15.0	50.0	0.00
M:57225	08N 03W 09 CDA	0.0	10.0	40.00
M:57226	08N 03W 09 D	43.0	12.0	24.00
M:57227	08N 03W 10	140.0	40.0	4.00

M:57228	08N 03W 10 CDD	48.0	10.0	40.00
M:57231	08N 03W 15	290.0	10.0	40.00
M:57230	08N 03W 15	70.0	10.0	17.00



ALHAMBRA HOT SPRINGS, P.A. NO. 22-049

T08N, R03W, SECTION 16
SCALE: 1" = 1000'



LEGEND

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
—<	OPEN ADIT	━	CULVERT
—+<	COLLAPSED ADIT	☀	LIGHT (LIGHT POLE)
⊠	OPEN SHAFT	⊘	UTILITY POLE
◙	COLLAPSED SHAFT	●	CENTERLINE MONUMENT
⬭	EXCAVATION	●	DECIDUOUS TREE
⬭	WASTE ROCK DUMP	✱	CONIFEROUS TREE
⨯⨯⨯	COLLAPSED TIMBERS	—•—•—	WOOD FENCE
—+—	RAILS	-•-•-•-	WIRE FENCE
░	DUMP	▨	BUILDING
◕	LAB SAMPLE	○	BARRIER POST
⊕	XRF SAMPLE	⋏	GATE
⊕W	WATER SAMPLE GROUND AND SURFACE	— · — · —	EDGE OF ASPHALT
—►—	DRAINAGE	— — —	EDGE OF GRAVEL
●	WATER WELL	▼	SLOPE DIRECTION
		WR	WASTE ROCK
		TP	TAILINGS POND

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

ALHAMBRA HOT SPRINGS PA# 22-049
ALHAMBRA DISTRICT JEFFERSON COUNTY

PIONEER

TDH

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS—BOZEMAN—KALISPELL MONTANA
SPOKANE WASHINGTON

DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

SHEET NO.

22-049.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Flammang

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	430	West of adit mouth	None	5.2 (S)	0.08	22-049-WR-1	08/17/93 1700	T-Metals, ABA
WR-2	WR	130	Approx. 5′ off of front of knob	None	5.95 (S)	0.04	22-049-WR-2	08/17/93 1715	T-Metals, ABA
WR-3A	WR	5,000	Approx. 15′ east and 10′ below log fence corner	None	6.48 (S)	0.06			
WR-3B	WR		West side of WR-3 just before it turns north 8′ down from top	None	5.95 (S)	NC			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-049-WR-1 is WR-1. 22-049-WR-2 is composite of WR-2 and WR-3A and -3B. NC = Not Collected.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:____________

Filled shafts: Yes___, No X , Number:____ Identification:____________

Seeps/Springs: Yes___, No X , Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 973

Distance to nearest well used for drinking? 750 feet

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely X .
Very low metal values present in dumps; no sulfides.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ______________________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______________________________

____

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X , Name(s):________

Dry streambeds: Yes____, No X , Name(s):________

Other surface water: Yes____, No X , Name(s)/Description:________

Waste materials within any floodplain: Yes____, No X Source ID(s):_

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A
High Flow:________, **Average Flow:**________

Distance between waste source(s) and nearest surface water body (ft)?
Approx. 200 feet from base of WR-3 to Warm Springs Creek.

Surface water draining onto or through waste sources: Yes____, No X ,
Describe:________

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, wetland, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes_____,
No X , **Distance downstream (ft)?**________ **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):________
N/A

SURFACE WATER INVENTORY FORM

SAMPLERS: ______________________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.											

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______________________________

____

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None; all area below mines are residential.

Wetlands present: Yes___, No X, Describe:

Carbonate rocks/soils: Yes___, No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000 X; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 0 feet; driveway appears to be made of WR-3

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Flammang

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Dry	1,530	1,530	No	None
WR-2	None	Dry	468	234	Yes	Low
WR-3	None	Dry	9,135	6,851	Yes	Moderate, when disturbed

Notes and Clarifications: WR-1 may have 4" of cover soil over actual waste rock.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X , No____, Describe: Four or five trailer houses within 200 feet.

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300 X ; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments______

Evidence of recreational use on site: Yes X , No___, Describe: Trail on WR-3 from one house to another; childrens' toys on WR-1 and -2.

Accessibility - Fences, warning signs, closed roads? Grate over Shaft #1.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No X , Comment______
Wilderness Area - Yes___, No X , Comment______
T&E Species Habitat - Yes___, No X , Comment______
Bat Habitat - Yes___, No X , Comment______

Primary Drainage___; Secondary Drainage X ; No Information___:

Riparian Habitat Quality - High___, Medium X , Low___
Wetlands Frontage - High___, Medium X , Low___
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No X , Number____, types and locations:___

Hazardous structures: Yes___, No X , Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes X , No___, Number 1 , types and locations: Highwall above adit is approx. 8 to 10 feet high; children in area could easily injure themselves.

Unstable waste piles, impoundments, undercut banks: Yes X , No____, Number 1 , types and locations: WR-3 is steep and hard pack in most places; easy to slide down.

Fire and/or Explosion hazards: Yes___, No X , Explain:______

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands Portal Inventory for the Alhambra Hot Springs site, Prepared by Daphne Digrindakis, April 4, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Alhambra Hot Springs site, Prepared by Northern Engineering and Testing, May 31, 1988.

USGS, Topographic Map, Clancy, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

ALHAMBRA HOT SPRINGS
PA NO. 22-049

MDSL AMRB/PIONEER 4/9/93

Alhambra Hot Springs PA# 22-049
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – BABITS
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22–049–WR–1	21.2 J	310 J	1.2 J	1.66 U	1.17 U	171	3650	2.26	53.7	2.17 U	4260 J	17.5 J	148 J	NR
22–049–WR–2	14.3 J	529 J	1.4 J	4.75	1.18 U	10.2	9920	0.473	288	3.43	106 J	5.3 U	66.1 J	NR
BACKGROUND	32.1 J	77.7 J	0.9 J	14.1	16.8	29.2	27200	0.029 U	587	9.28	52.7 J	5.46 U	116 J	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22–049–WR–1	0.07	2.19	1.43	–0.76	0.02	<0.01	0.05	0.00	1.43
22–049–WR–2	0.05	1.56	4.30	2.74	0.03	<0.01	0.02	0.00	4.30

LEGEND

WR1 – Sample of subsample WR1.
WR2 – Composite of subsamples WR2, 3A, and 3B.
BACKGROUND – From Middle Fork Warm Springs.
(22–046–SS–1).

XRF ANALYSIS RESULTS

ALHAMBRA HOT SPRINGS
PA NO. 22-049

Mine Name: Alhambra Hot Srings PA# 22-049
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-049-WR-1		20260.4	1928.68	768.473			11921.5		320.898	319.39		81.3979
22-049-WR-2		28151.4	2945.57	1355.57		541.964 *	28981.6			99.3354 *	49.9418 *	125.508
22-049-WR-2-COMP		25684.1	2977.55	777.644		584.941 *	20469.1			153.555		108.69
22-049-WR3-A		14619.3	1756.13				11288.8			193.895		76.5179
22-049-WR3-B		26985.7	4724.11	1494.86		385.852 *	19543.7		51.9148 *	83.0063 *	38.3868 *	104.383

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-049-WR-1	65.8465		19.4118	5306.74	173.927		74.6017 *	429.073	88.7446 *	22.6456 *	41.1017 *
22-049-WR-2	137.704				209.812			321.947			23.101 *
22-049-WR-2-COMP	69.154		6.38762 *	146.351	176.853			993.182			13.5225 *
22-049-WR3-A	39.1684		15.2791	190.372	105.918			1441.48		25.2471 *	38.4838
22-049-WR3-B	89.8135			34.5005 *	184.218			265.999		19.2348 *	24.9859

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

ALHAMBRA HOT SPRINGS
PA NO. 22-049

AIMSS SCORESHEET

SITE NAME: ALHAMBRA HOT SPRINGS
PA NUMBER: 22-049

LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.431
6		WELLS - 1 MI. x 2.5		315.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		285
8		NEAREST WELL		10
9		TARGETS SCORE	LINES 6 + 7 + 8	610.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	174582
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.576
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19	SW - TARGETS	FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	1135
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	300
27		LIKELIHOOD SCORE	LINES 25 + 26C	300
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.047
29		POPULATION - 4 MILES		300
30		NEAREST RESIDENCE		10
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	320
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	4512
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		250
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	650
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.043
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		100
41		NEAREST RESIDENCE		10
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 - 42	120
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	3354
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**1.84**

SITE NAME: ALHAMBRA HOT SPRINGS
PA NUMBER: 22-049

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	75
9		POPULATION - 1 MILE		100
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 - 11	120
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**180.00**

22-049, #18: Adit at WR-1

22-049, #19: WR-2

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: SOLAR SILVER **PA#:** 22-054

Date: August 17, 1993 **Time:** 1300

Field Team Leader: Babits, Pioneer

Sampling Personnel: Flammang, Pioneer
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; raining (on and off drizzle); cool (50°F); slight breeze; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #17: WR-7 and quonset. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): The Solar Silver mine had very little historic information on its location. From archived files at DSL/Hardrock Bureau, it is believed that the site is a discharging adit on an unnamed tributary of the Middle Fork Warm Springs Creek. The site is surrounded by the Middle Fork Warm Springs site (22-046). Solar Silver was sampled as part of the Middle Fork Warm Springs site and separated later.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Adit discharge exceeds Maximum Contaminant Levels for Cd and needs to be treated. Waste rock is in floodplain and should be bermed back and revegetated.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): SOLAR SILVER PA#: 22-054

Legal Description: T 8N ;R 2W ;Sec. 30 , SE1/4 SE1/4 ___1/4

County: JEFFERSON Mining District: WARM SPRINGS
Latitude: N 46° 25' 00" Longitude: W 111° 53' 48"

Primary Drainage Basin and Code: Middle Frk. Warm Springs/10030101
Secondary Drainage Basin: Unnamed Tributary to Middle Frk. Warm Springs Creek
USGS Quadrangle map name(s): Clancy

Mine Type/Commodities: Hardrock/Lead, Silver, Gold
Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Dudley Krenz, 14452 91st Place, Maple Grove, MN 55369. (612) 420-4146; Gary and Karen Hutchinson, 5583 Autumn Wind Court, Helena, MT 59601. (406) 227-7442; Marilyn Webber, 8721 North Terry Court, Spokane, WA 99208. (509) 467-5748; Elizabeth Gibson, c/o Grace Nelligan, 83 Brookside, Missoula, MT 59802; Clifton Dillon, c/o Dennis Hulst, 248 Hartley, Helena, MT 59601. (406) 449-6890; Marcia Schimpf-Knudsen, 822 West Alpine Avenue, Stockton, CA 95204; Helena National Forest.

Relationship to other mines/sites in the area/district: This site is just below the Middle Fork Warm Springs site. There are tailings in the drainage approx. 0.5 mile downstream from the site.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 5480', Slope 24°,
Aspect Northwest

Land use: Mining___, Recreational X , Residential___, Urban___,
Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? Approx. 1 acres.
Dimensions:

Predominant vegetation types: Firs, pines, aspens, willows

Access: roads - good___,poor___,4wd X ,trail___.
Other logistical considerations (proximity to other sites). Road closed to vehicle traffic at base of site; must come from next drainage over from site.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). A tributary of the Middle Fork of Warm Springs Creek flows southeast to northwest adjacent to the site. The Middle Fork of Warm Springs Creek flows into Warm Springs Creek two miles downstream and Warm Springs Creek flows into Prickly Pear Creek three miles downstream. The site is underlain by quartz monzonite.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?
Shafts - Yes___, No X, # ___, Comment
Adits - Yes X, No___, # 1, Comment Open
Pits - Yes___, No X, # ___, Comment
Placers - Yes___, No X, # ___, Comment
Other - Yes___, No X, # ___, Comment

Mill Operation? Yes___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

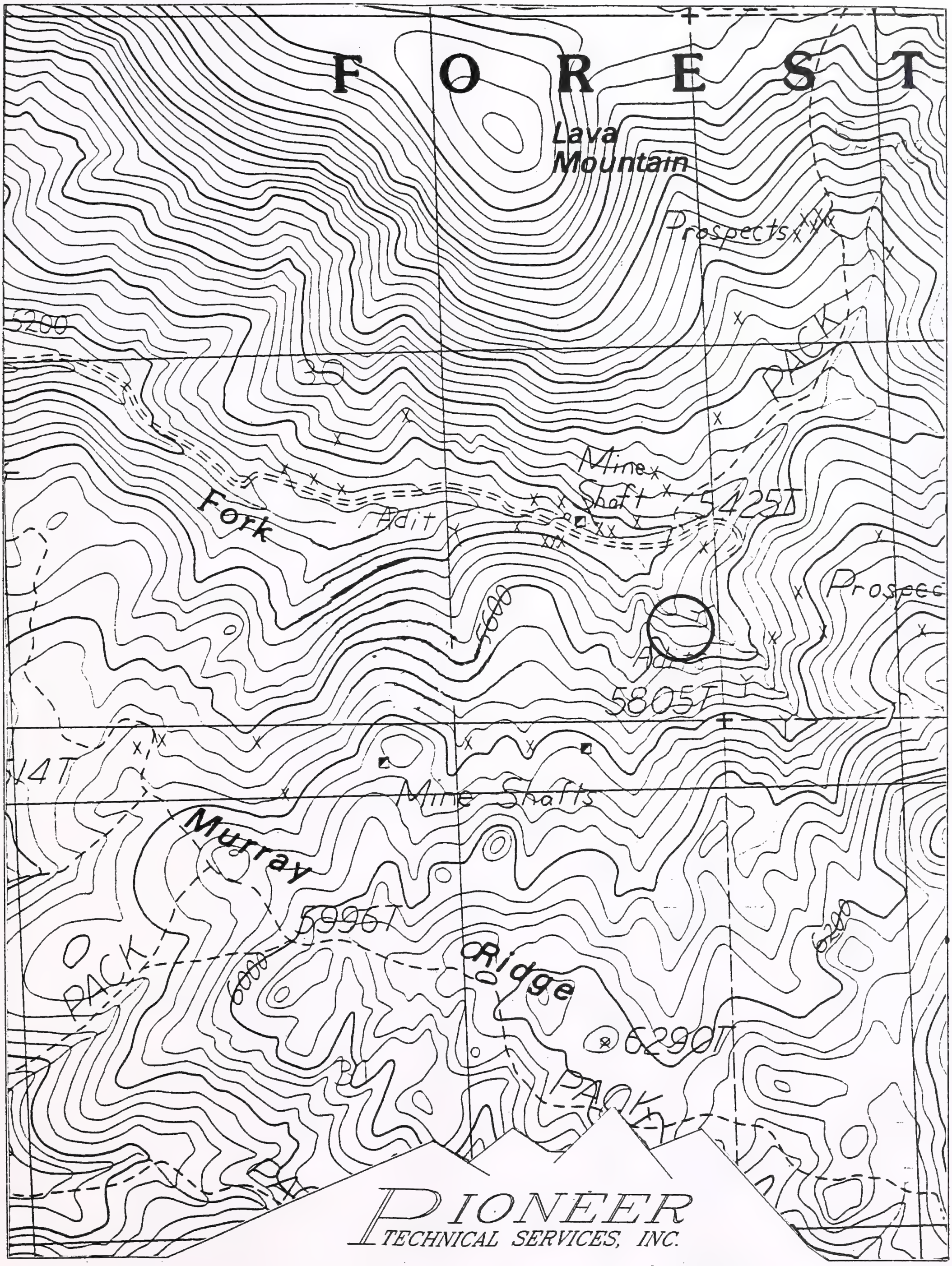
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

10/29/1993

Well No.	Location	Depth	Yield	Static Water Level
M:57145	08N 02W 32 DC	240.0	15.0	22.00
M:124176	07N 02W 04 BD	83.0	20.0	40.00

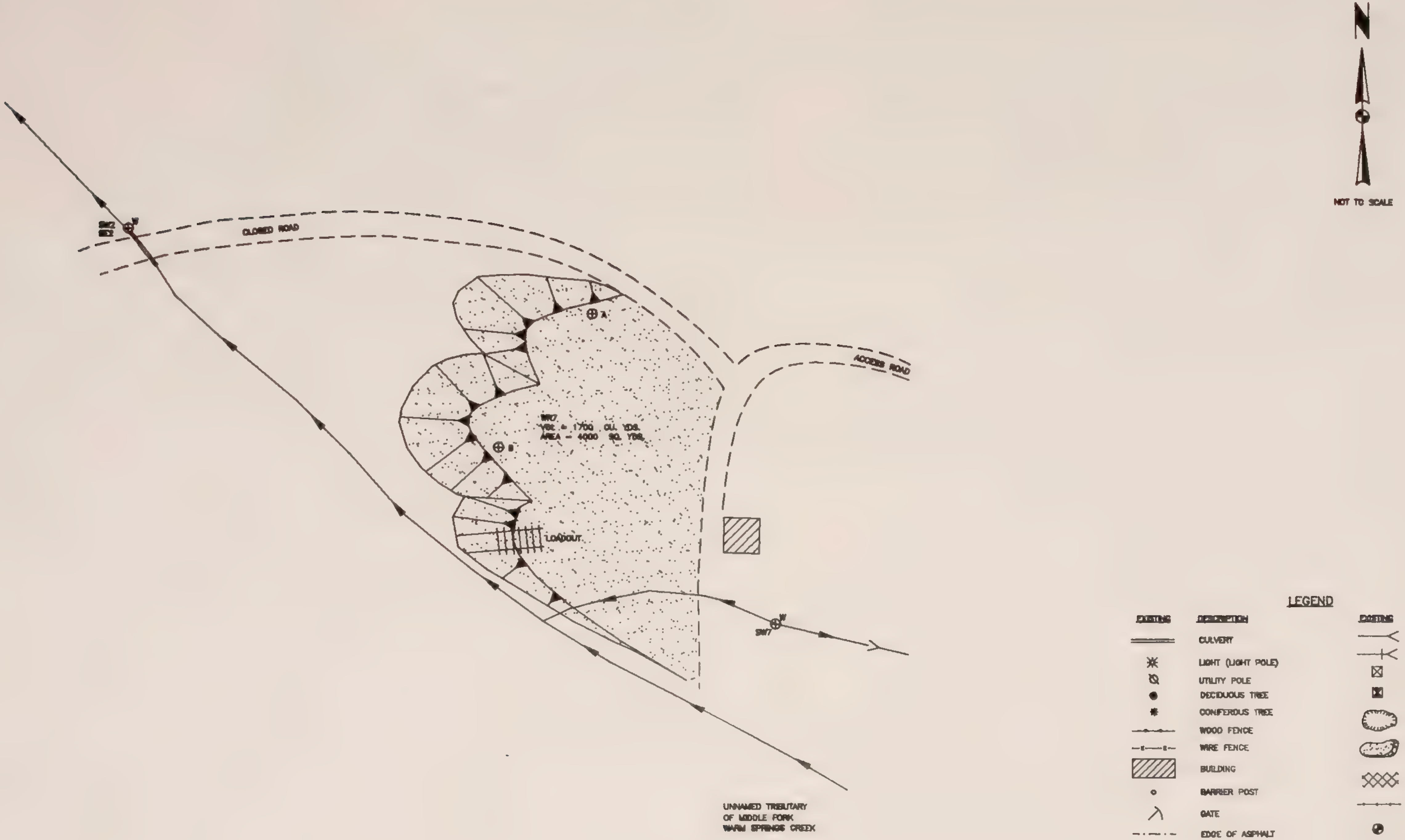


PIONEER
TECHNICAL SERVICES, INC.

SOLAR SILVER, P.A. NO. 22-054

T08N, R02W, SECTION 29

SCALE: 1" = 1000'



LEGEND

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
═══	CULVERT	—<	OPEN ADIT
✳	LIGHT (LIGHT POLE)	—+<	COLLAPSED ADIT
⌀	UTILITY POLE	⊠	OPEN SHAFT
●	DECIDUOUS TREE	⧓	COLLAPSED SHAFT
✸	CONIFEROUS TREE	⬭	EXCAVATION
—•—•—	WOOD FENCE	⬭	WASTE ROCK DUMP
—x—x—	WIRE FENCE	✕✕✕	COLLAPSED TIMBERS
▨	BUILDING	—+—+—	RAILS
○	BARRIER POST	◕	SOIL SAMPLE
⋏	GATE	⊕	XRF SAMPLE
—·—·—	EDGE OF ASPHALT	⊕W	WATER SAMPLE GROUND AND SURFACE
— — —	EDGE OF GRAVEL	—◀—	DRAINAGE
▼	SLOPE DIRECTION	●	WATER WELL
	TAILINGS POND	≡	PONDED WATER
		⩛	VEGETATED WET LANDS

DRAWN CAJ DATE 12\14\93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

PIONEER
TECHNICAL SERVICES, INC. BUTTE, MT.

TD&H

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

SOLAR SILVER PA#22-054
ALHAMBRA DISTRICT JEFFERSON COUNTY

SHEET NO.

22-054.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Flammang

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-7A	WR	1,700	North end of dump by road	None	4.3 (D)	0.05	22-046-WR-5	08/18/93 1140	T-Metals, ABA
WR-7B	WR		South end of dry drainage	None	4.4 (D)	0.05			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-045-WR-5 is composite of WR-7A and -7B, and was collected and submitted to the lab under Middle Fork Warm Springs site (22-046), not Solar Silver. Background soil was collected with the Middle Fork Warm Springs site.

MDSL AMRB/PIONEER 4/9/93

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No ___, Number: 1 Identification: At WR-7

Filled shafts: Yes ___, No X, Number: ___ Identification: ___

Seeps/Springs: Yes ___, No X, Number: ___ Identification: ___

Groundwater wells within 4 miles?: Yes X, No ___;
Number of well logs: 973

Distance to nearest well used for drinking? 3 miles

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite ___, Probable ___, Possible X, Unlikely ___.
Uncontained source; adit discharging to surface water.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-7	AD	Adit discharge at WR-7	20 gpm (E)	6.94	293	152	NM	119	N/A	22-046-SW-7	08/17/93 1345	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): 22-046-SW-7 was collected and submitted to lab for analysis under Middle Fork Warm Springs (22-046), not Solar Silver.

NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Unnamed tributary to the Middle Fork of Warm Springs Creek

Dry streambeds: Yes ___, No X, Name(s):

Other surface water: Yes ___, No X, Name(s)/Description:

Waste materials within any floodplain: Yes X, No ___ Source ID(s): WR-7 is in unnamed tributary to Middle Fork Warm Springs Creek.

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? 50 gpm during sampling
High Flow: 600 gpm, Average Flow: 60 gpm

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No ___,
Describe: Adit discharge flows through WR-7.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Wetland; Prickly Pear Creek has agriculture, irrigation, possible residential and fishery.

Observed erosional/sedimentation/stream turbidity problems? Yes ___, No X, Distance downstream (ft)? ___ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	200' above WR-1 at Middle Fork Warm Springs Mine	5.67	106	122	NM	47	15 gpm (E)	22-046-SW-1	08/17/93 1145	T-Metals, TDS, Hardness, Cl-, SO4, NO2/NO3
SE-1	SE	200' above WR-1 at Middle Fork Warm Springs Mine	N/A	N/A	N/A	N/A	N/A	N/A	22-046-SE-1	08/17/93 1145	T-Metals
SW-2	SW	150' downgradient in unnamed tributary from WR-7	7.68	196	187	NM	56	50 gpm (E)	22-046-SW-2	08/17/93 1405	T-Metals, TDS, Hardness, Cl-, SO4, NO2/NO3
SE-2	SE	150' downgradient in unnamed tributary from WR-7	N/A	N/A	N/A	N/A	N/A	N/A	22-046-SE-2	08/17/93 1405	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): 22-046-SW-1, 22-046-SE-1, 22-046-SW-2, and 22-046-SE-2 were collected and submitted to the lab under Middle Fork Warm Springs (22-046), not Solar Silver. NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 30 acres

Wetlands present: Yes X , No___, Describe: Marsh and streamside

Carbonate rocks/soils: Yes X , No___, Describe: Some limestone

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100 X ; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments___

Nearest residence(ft or miles)? 3 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Flammang, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-7	SO3; pH	Dry	36,000	18,000	Yes	Low
SW-7	Algae; moss	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

MDSL AMRB/PIONEER 4/9/93

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:____

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments____

Evidence of recreational use on site: Yes___, No_X_, Describe:________

Accessibility - Fences, warning signs, closed roads? Road closure to site; access from another road with gate, but it is not locked.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment________
Wilderness Area - Yes___, No_X_, Comment________
T&E Species Habitat - Yes___, No_X_, Comment________
Bat Habitat - Yes_X_, No___, Comment Open adit

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1_, types and locations:___
Adit at WR-7

Hazardous structures: Yes___, No_X_, Number____, types and locations:_
Steel quonset appears sound.

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:____

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:____

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________________

Bibliography

MBMG, Solar Silver Mine, Jefferson County, Form 39, 1976-1980, 1982 and 1983.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

USGS, Topographic Map, Clancy, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

SOLAR SILVER
PA NO. 22-054

Solar Silver PA# 22-054
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – BABITS
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22–046–SE–2	1130 J	37.9 J	15 J	13.4	15.8	115	32500	0.206	814	7.71	263 J	7.59 U	1610 J	NR
22–046–WR–5	2760 J	29.1 J	1 J	6.95	6.07	83	56800	0.037	720	3.4	715 J	6.91 U	667 J	NR
BACKGROUND	32.1 J	77.7 J	1 J	14.1	16.8	29.2	27200	0.029 U	587	9.28	52.7 J	5.46 U	116 J	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22–046–WR–5	1.37	42.8	–5.5	–48.	125	<0.01	0.16	0	–5.55

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22–046–SW–1	2.5	6.17	2.57 U	9.7 U	6.83 U	1.77 J	67.5	0.25 J	6.07	12.7 U	0.72 U	30.7 U	13.3	28.1
22–046–SW–2	23.1	8.27	8.27 J	9.7 U	6.83 U	12.8 J	337	0.21 J	317	12.7 U	2.22	30.7 U	1290	101
22–046–SW–7	152	6.4	10.9 J	9.7 U	6.83 U	108 J	4810	0.22 J	1490	12.7 U	5.03	30.7 U	2250	271

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2–N	CYANIDE
22–046–SW–1	81	< 5.0	9	< 0.05	NR
22–046–SW–2	176	< 5.0	61	< 0.05	NR
22–046–SW–7	373	< 5.0	172	< 0.05	NR

LEGEND

SE1 – Upgradient on unnamed tributary (250') of Midd. Frk. Wrm. Sprgs.
SE2 – Downgradient (150') unnamed tributary from waste rock dump 7.
WR5 – Composite of subsamples WR7B and 7A.
BACKGROUND – From the Middle Fork Warm Springs (22–046–SS–1).

SW1 – Same as sample SE1.
SW2 – Same as sample SE2.
SW7 – Adit discharge at waste rock dump 7.

NOTE: 22–046–WR–5 was collected and submitted to the lab under 22–046, not as 22–054 (Solar Silver).

XRF ANALYSIS RESULTS

SOLAR SILVER
PA NO. 22-054

MDSL AMRB/PIONEER 4/9/93

Mine Name: Solar Silver PA# 22–054
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22–054–WR7–A		18825.3	21270.7	2548.76			62233.1		79.5386 *	490.712	1882.93	119.183
22–054–WR7–B		18372.3	19277.1	2813.33		666.884 *	65021.3			330.637	3761.81	303.537

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22–054–WR7–A	203.618			703.594	213.768			252.287	110.572 *		14.3334 *
22–054–WR7–B	197.835			369.225	193.297			482.454	96.9055 *		18.0596 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

SOLAR SILVER
PA NO. 22-054

MDSL AMRB/PIONEER 4/9/93

AIMSS SCORESHEET

SITE NAME: SOLAR SILVER
PA NUMBER: 22-054

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	5.592
6	GW - TARGETS	WELLS - 1 MI. x 2.5		5.0
7		WELLS - 1 TO 4 MI		45
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	50.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	111840

SURFACE WATER PATHWAY

11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		50
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	750
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	5.792
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	78192

AIR PATHWAY

25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.349
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	40
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	698

DIRECT CONTACT PATHWAY

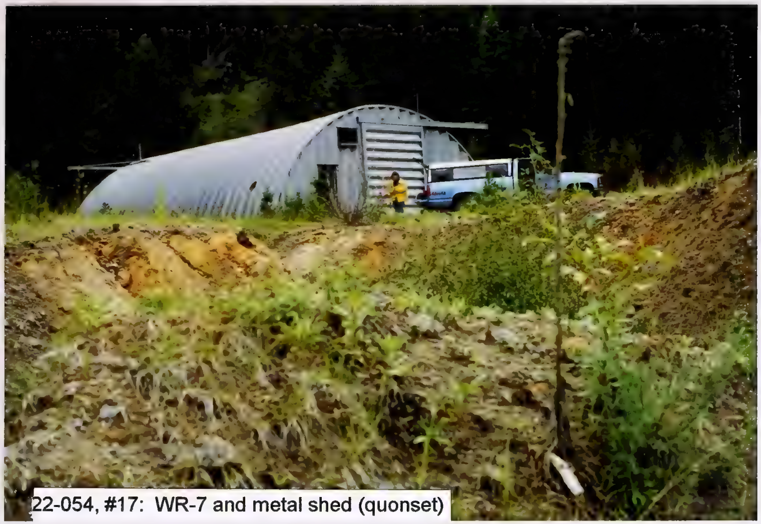
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	50
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.339
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	1
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	17

45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000	**1.91**

SITE NAME: SOLAR SILVER
PA NUMBER: 22-054

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	50
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	1
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.50**



22-054, #17: WR-7 and metal shed (quonset)

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: BULLION **PA#:** 22-008

Date: July 6, 1993 **Time:** 0830-1630

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Cloudy; cool (50°F); windy.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #2,#3: TP-1B; #4: TP-2A #5: TP-2B; #6: SW-1 location; #7: SW-2 location; #8: Looking up hillside from top of TP-1 at loadout above mill foundation; #9: SW-3 location; #10: WR-7; #11: Collapsed adit with discharge of WR-7; #12: Mill and loadout and floatation cells from road; #13: WR-5; #14: WR-6 and trenching; #23: WR-2A; #24: WR-2B. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Study water treatment alternatives. Remove wastes from drainage. Grade, amend, and revegetate dumps where possible. Repository for some wastes may be required.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BULLION PA#: 22-008

Legal Description: T 7N ;R 6W ;Sec. 13 , SW1/4 SE1/4 ___ 1/4

County: JEFFERSON Mining District: BASIN

Latitude: N 46° 21' 22" Longitude: W 112° 17' 40"

Primary Drainage Basin and Code: Basin Creek/10020006
Secondary Drainage Basin: Jack Creek

USGS Quadrangle map name(s): Basin

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Lead, Zinc

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Delbert and Allan Bullock, Box 66, Basin, MT 59631. (406) 225-3260; Keith and Donald Johnson, First National Bank Building, Butte, MT 59701. (406) 723-5411; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Same vein as the Crystal mine, may be connected underground. Worked in conjunction with the Grey Eagle mine.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7650' , Slope 15° ,
Aspect Northern

Land use: Mining___, Recreational X , Residential___, Urban___,
Agricultural X , Other(Specify)___

Area of disturbed/unvegetated lands? Approx. 10 acres.
Dimensions: 3,000 feet x 300 feet

Predominant vegetation types: Lodgepole pine, willow, grasses, grouse whortleberry

Access: roads - good___,poor___,4wd X ,trail___.
Other logistical considerations (proximity to other sites).___

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is near the headwaters of Jack Creek. The rocks in the Basin District are principally cretaceous and tertiary volcanic rocks and granitic rocks of the Boulder Batholith.

Mining/milling history, ore type/tenor, host rock, gangue: Vein was discovered approx. in 1882 and patented in 1897. A 150-ton concentrator was constructed in 1905. The vein is a western extension of the Crystal vein and cuts coarse-grained light quartz monzonite. Metallic sulfides in the vein include pyrite, tetrahedrite, galena, sphalerite, chalcopyrite, and arsenopyrite in a gangue of white quartz and post-sulfide grey flinty quartz. Uranium is associated with the late chalcedonic quartz.

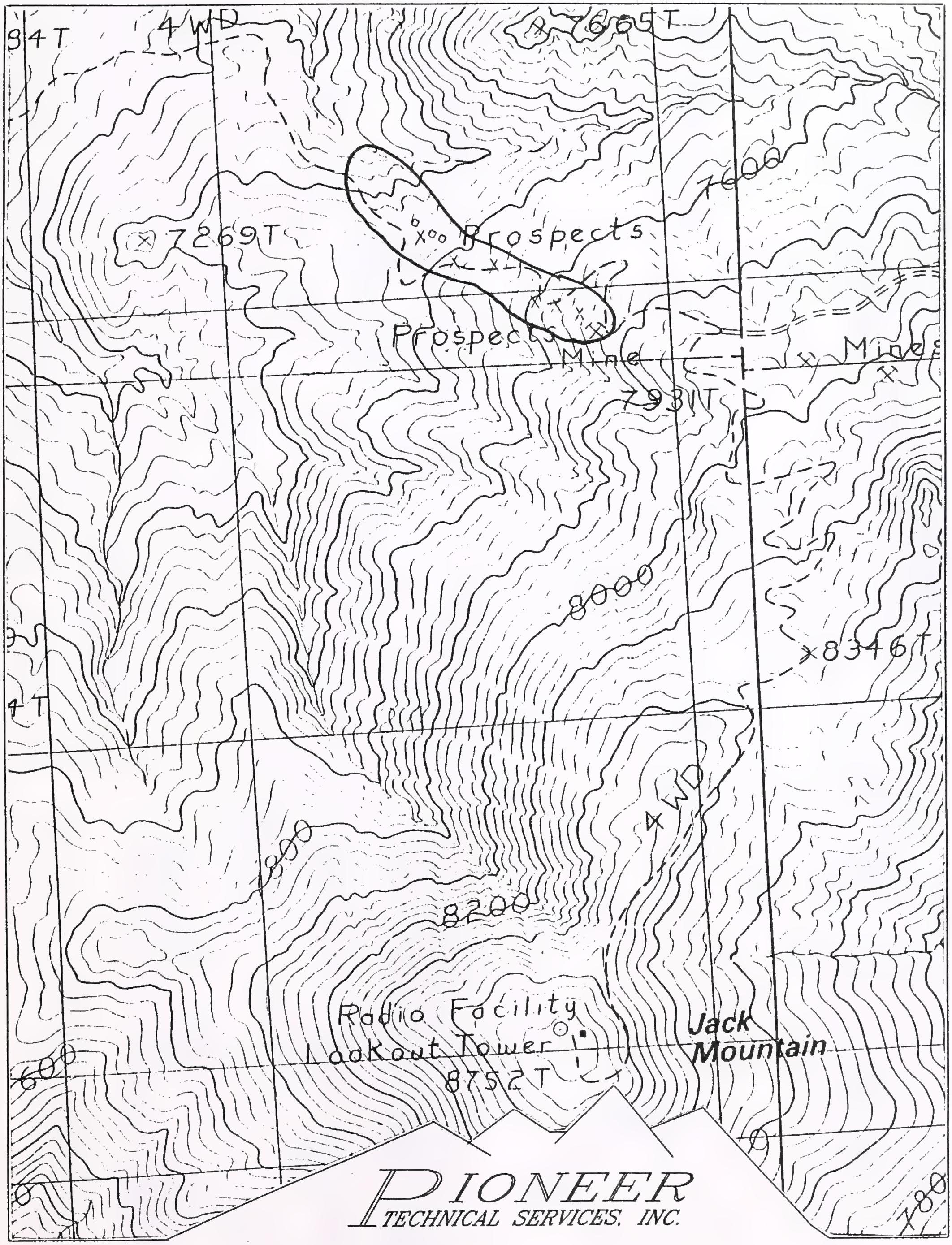
Mine Operation?
Shafts - Yes___, No X, # ___, Comment
Adits - Yes X, No___, # 4, Comment Caved
Pits - Yes X, No___, # 3, Comment 2 very large
Placers - Yes___, No X, # ___, Comment
Other - Yes___, No X, # ___, Comment

Mill Operation? Yes X, No___. If yes answer the next three questions:

Period(s) of Operation: 1905 to approx. 1955

Origin of Ore Milled - Custom Mill___ Dedicated Mill X; Number and names of mines that supplied mill feed: N/A

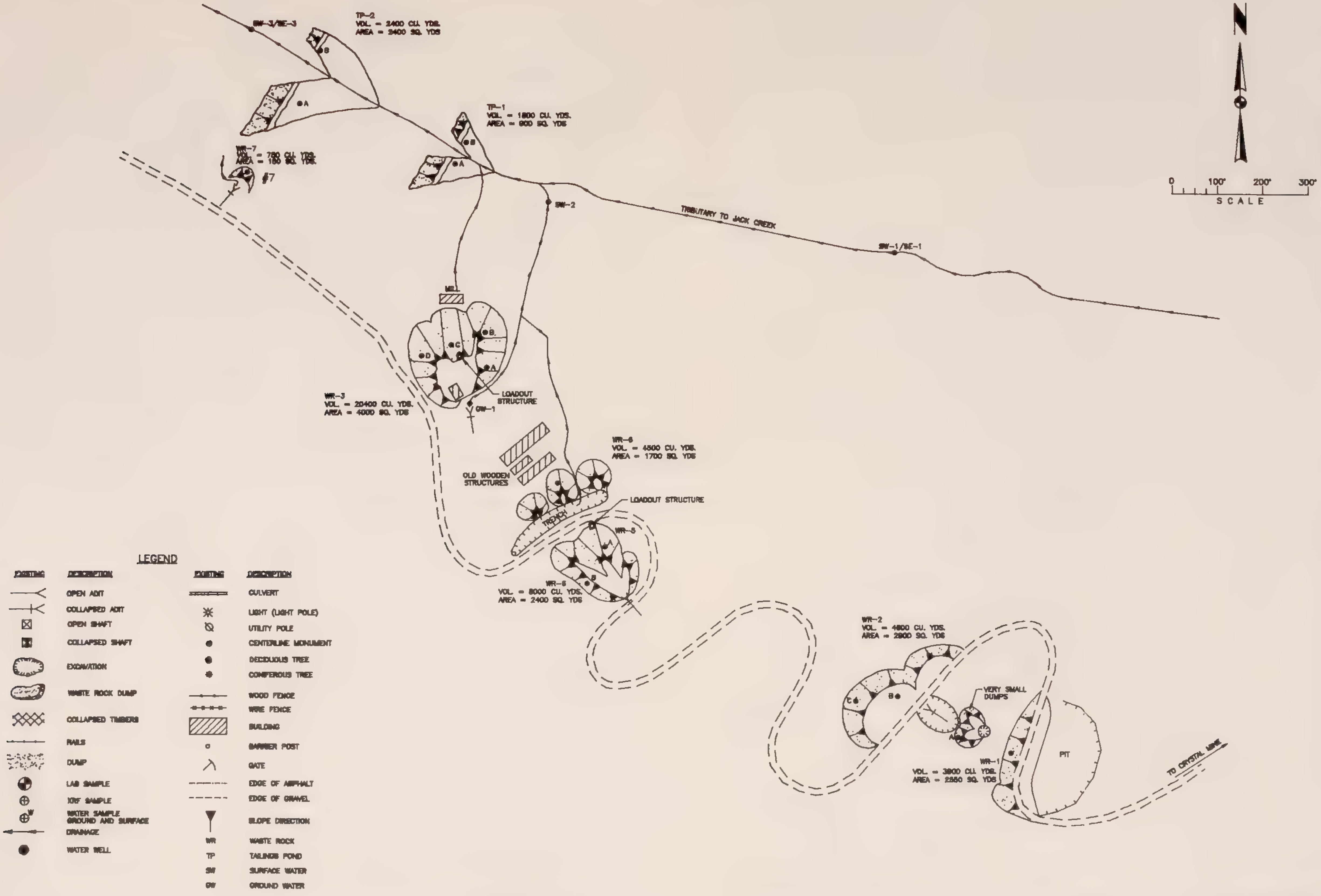
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Floatation



PIONEER
TECHNICAL SERVICES, INC.

BULLION, P.A. NO. 22-008

T07N, R06W, SECTION 13
SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

BULLION MINE & MILL PA #22-008
BASIN DISTRICT JEFFERSON COUNTY

PIONEER

TDH

DRAWN MWC DATE 8/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

SHEET NO.

22-008.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Silts on downstream ends of impoundments, 25%; medium sand further upstream

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Upstream pond is approx. 7' deep with tan surface tailings and gray reduced tailings below. The beaver pond is shallow, averaging 1.5' with deeper piles approx. 5' deep near the former dam.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry near surface (0'-1'); wet below and in drainage

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Both dams are severely breached and majority of tailings (60%) have been washed out.

Comments on potential for mitigation: Small volume present - could be removed from drainage and placed up near old mill; potential to reprocess.

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Belanger, Clark*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	3,900	Center of dump associated with exploration pit at top	None	6.8 (D)	0.04	N/A	N/A	XRF Analysis
WR-2A	WR	4,600	Dump directly above Adit #2	None	6.5 (D)	0.07	N/A	N/A	XRF Analysis
WR-2B	WR		Large pile below Adit #2; tan/yellow sand	None	6.0 (D)	0.04	22-008-WR-1	07/06/93 1330	T-Metals, ABA
WR-2C	WR		Large dump below Adit #2; west end	None	5.0 (D)	0.03			
WR-3A	WR	20,400	East side of large dump below adit with discharge above mill	None	5.0 (D)	0.045	N/A	N/A	XRF Analysis
WR-3B	WR		Northeast side of large dump below adit with discharge above mill	None	5.2 (D)	0.05			
WR-3C	WR		North end of large dump below adit with discharge above mill	None	5.8 (D)	0.035	N/A	N/A	XRF Analysis
WR-3D	WR		West side of large dump below adit with discharge above mill; barrow area	None	NM	0.04	22-008-WR-2	07/06/93 1350	T-Metals, ABA
WR-5A	WR	8,000	Adit #3 dump; north side	None	< 3.5 (D)	0.045			
WR-5B	WR		Adit #3 dump; southwest side	None	6.0 (D)	0.05			
WR-6	WR	4,500	Trench pile between Adit #1 and Adit #2	None	4.9 (D)	0.05	N/A	N/A	XRF Analysis
WR-7	WR	750	Dump associated with Adit #7 below; southwest of site	None	< 3.5 (D)	0.03	N/A	N/A	XRF Analysis
SS-1	BKGRND	N/A	Background soil	N/A	N/A	N/A	22-008-SS-1	07/06/93 1530	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-008-WR-1 is composite of WR-2B and -2C, and WR-3B. 22-008-WR-2 is composite of WR-5A and -5B, and WR-3D. NM = Not Measured

*Continued on next page

SOURCE INVENTORY FORM (Cont'd)

SAMPLERS: Bullock

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1A-A	TAIL	1,800	South side of upper pond near dam; 0'-1.5'	Breached log dam	6.0 (D)	0.045	22-008-TP-1	07/06/93 1710	T-Metals, ABA
TP-1A-B	TAIL		South side of upper pond near dam; 3'-5.5'	Breached log dam	3.5 (D)	0.04			
TP-1A-C	TAIL		South side of upper pond near dam; 5.5'-6.5'	Breached log dam	4.2 (D)	0.07			
TP-1A-D	TAIL		South side of upper pond near dam; 6.5'-7', underlying soil	Breached log dam	NM	0.04	22-008-TP-3	07/06/93 1745	T-Metals, ABA
TP-1B-A	TAIL		North side of upper pond near dam; 0'-3'	Breached log dam	6.0 (D)	0.045			
TP-1B-B	TAIL		North side of upper pond near dam; 3'-6.5'	Breached log dam	4.2 (D)	0.05			
TP-2A-A	TAIL	2,400	South side of lower pond near dam; 0'-2'	Breached earthen dam	5.5 (D)	0.05	22-008-TP-2	07/06/93 1730	T-Metals, ABA
TP-2A-B	TAIL		South side of lower pond near dam; 2'-4'	Breached earthen dam	5.2 (D)	0.045			
TP-2A-C	TAIL		South side of lower pond near dam; 4'-4.5'	Breached earthen dam	4.1 (D)	0.07			
TP-2B-A	TAIL		North side of lower pond near dam; 0'-1'	Breached earthen dam	5.0 (D)	0.045			
TP-2B-B	TAIL		North side of lower pond near dam; 1'-1.5'	Breached earthen dam	3.7 (D)	0.03			
TP-2B-C	TAIL		North side of lower pond near dam; 1.5'-2'	Breached earthen dam	< 3.5 (D)	0.08			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-008-TP-1 is composite of TP-1A-A through -1A-C, and TP-1B-A and -1B-B. 22-008-TP-2 is composite of TP-2A-A and -2A-B, and TP-2B-A and -2B-B. 22-008-TP-3 is composite to TP-1A-D, TP-2A-C, and TP-2B-C.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes_X_, No___, Number:_2__ Identification:_Adit #2 and Adit #7

Filled shafts: Yes___, No_X_, Number:____ Identification:____

Seeps/Springs: Yes_X_, No___, Number:____ Identification:_Several seeps above the mine on hillside between mill and WR-7 (logged area)

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_9____

Distance to nearest well used for drinking?_Well logs indicate wells within 1 mile, but none were observed in the Jack Creek Basin.

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite_X__, Probable____, Possible____, Unlikely____.
Groundwater discharge from Adit #1 very low pH and very high specific conductance.

Other observations/notes:_Room available for passive treatment systems.

GROUNDWATER INVENTORY FORM

SAMPLERS: Bullock, Clark

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
GW-1	AD	Adit #6 discharge above mill	7 gpm (E)	2.92	2610	439	4.9	18	N/A	22-008-GW-1	07/06/93 1030	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
GW-2	AD	Adit #7 discharge	4 gpm (E)	6.48	215	235	3.4	N/A	N/A	N/A	N/A	Field Parameters

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No sample collected from Adit #7 due to low flow and near normal field parameter measurements.

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Jack Creek

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes X, No ___, Name(s)/Description: Several seeps/springs with runoff in several locations along the northeastern hillside

Waste materials within any floodplain: Yes X, No ___ **Source ID(s):** TP-1 and TP-2

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? ___
High Flow: 25 cfs, **Average Flow:** 2.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No ___,
Describe: Jack Creek through tailings; Adit #6 discharge through WR-3.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetlands, riparian, irrigation, stock watering, fishery

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___, **Distance downstream (ft)?** >1000 **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Streambed load largely tailings; recent logging on the claim has increased runoff velocities and erosion.

SURFACE WATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Upgradient Jack Creek	6.23	30	290	5.4	28	1.75 cfs (M)	22-008-SW-1	07/06/93 1330	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Upgradient Jack Creek	N/A	N/A	N/A	N/A	N/A	N/A	22-008-SE-1	07/06/93 1330	T-Metals
SW-2	SW	PPE Adit #6 discharge after flowing through dumps	5.22	130	390	5.5	0	2.0 cfs (M)	22-008-SW-2	07/06/93 1300	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	PPE Adit #6 discharge after flowing through dumps	N/A	N/A	N/A	N/A	N/A	N/A	22-008-SE-2	07/06/93 1300	T-Metals
SW-3	SW	Downgradient Jack Creek approx. 100' below TP-2	5.91	300	292	NM	6	2.7 cfs (M)	22-008-SW-3	07/06/93 1230	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-3	SE	Downgradient Jack Creek approx. 100' below TP-2	N/A	N/A	N/A	N/A	N/A	N/A	22-008-SE-3	07/06/93 1230	T-Metals
SE-500	SE	Jack Creek 500' down from SW-3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	Jack Creek 1000' down from SW-3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 2-3 acres at 15° slope within mine site; approx. 4 acres below TP-2

Wetlands present: Yes X , No___, Describe: Small wetlands between and below the tailings ponds

Carbonate rocks/soils: Yes X , No___, Describe: Carbonate material pulled from lower workings, but not abundant in dumps.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments Recreational

Nearest residence(ft or miles)? Approx. 1 1/4 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Belanger, Clark

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
TP-1	SO3; FEOX; Low pH	Partial	8,100	8,100	Yes	Low
TP-2	SO3; FEOX; Low pH	Partial	21,600	10,800	Yes	Low
WR-1	SO3; FEOX	Dry	23,850	22,650	Yes	Low
WR-2	FEOX	Dry	26,100	26,100	Yes	Low
WR-3	SO3; FEOX; Low pH; VEG	Dry	36,000	36,000	Yes	Low
WR-5	SO3; Low pH	Dry	21,600	21,600	Yes	Low
WR-6	SO3; FEOX	Dry	15,300	15,300	Yes	Low
WR-7	SO3; FEOX; Low pH	Dry	1,350	675	Yes	Low
GW-1	Low pH; FEOX; SPG; Algae	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications: ______

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments_None_

Evidence of recreational use on site: Yes_X_, No___, Describe:_Off-road vehicle tracks, litter_

Accessibility - Fences, warning signs, closed roads?_Unrestricted_

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment________
Wilderness Area - Yes___, No_X_, Comment________
T&E Species Habitat - Yes___, No_X_, Comment________
Bat Habitat - Yes___, No_X_, Comment________

Primary Drainage_X_; Secondary Drainage___; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:___

Hazardous structures: Yes_X_, No___, Number_5_, types and locations:_Sheds, cabins, and loadout_

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_3_, types and locations:_Pit or trench highwalls are unstable._

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number____, types and locations:_Steep eroding dumps; tailings are also actively eroded._

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________

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MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet, Prepared by Daphne Digrindakis, September 2, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Bullion, Prepared by Northern Engineering and Testing, July 28, 1988.

USGS, Topographic Map, Basin, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

BULLION
PA NO. 22-008

Bullion PA# 22-008
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – BULLOCK
INVESTIGATION DATE: 07/06/93

SOLID MATRIX ANALYSES

Metals in soils — Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-008-SE-1	9 J	29.9	0.5 U	3.1	4.1	6.6	7440	0.038 J	163	4	8 J	3 U	34	NR
22-008-SE-2	2180 J	48.1	0.6 U	11.6	5.5	192	39200	0.062 J	853	13	179 J	15	313	NR
22-008-SE-3	1230 J	56.4	0.9	9	7.4	146	18600	0.066 J	396	7	393 J	21	275	NR
22-008-TP-1	2440 J	88.9	2.9	2.2	2.6	257	7260	0.203 J	16.9	4	3330 J	196	558	NR
22-008-TP-2	3420 J	118	0.5 U	1.1 U	2.8	172	11600	0.575 J	18.5	2 U	3870 J	164	104	NR
22-008-TP-3	4470 J	40.6	0.5 U	14	8.2	674	15100	0.373 J	7.9	4	5110 J	151	175	NR
22-008-WR-1	18100 J	138	0.6 U	1.7	2.3	137	36700	0.383 J	84.7	2 U	3610 J	254	135	NR
22-008-WR-2	1690 J	22.5	4.1	2.1	1 U	372	15800	0.519 J	83.7	2 U	11300 J	66	695	NR
BACKGROUND	68 J	344	0.6 U	22.1	20.3	35	35000	0.08 J	6830	21	39 J	5 U	188	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-008-TP-1DUP	0.31	9.68	0.42	-9.2	0.14	0.09	0.08	2.81	-2.39
22-008-TP-1	0.32	10	0.58	-9.4	0.15	0.08	0.09	2.5	-1.92
22-008-TP-2	0.21	6.56	-0.9	-7.4	0.19	0.01	0.01	0.31	-1.23
22-008-TP-3	1.21	37.8	-3.2	-41.	<0.01	1.24	0.1	38.7	-42
22-008-WR-1	1.04	32.5	-2.6	-35.	0.93	0.02	0.09	0.62	-3.23
22-008-WR-2	1.41	44	-4.3	-48.	1.1	<0.01	0.33	0	-4.39

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-008-GW-1	12700	8.57	736	508	13.3 J	19400 J	325000 J	0.038 U	31000 JX	142	743 JX	147	80600 J	366
22-008-SW-1	2.02	13.6	2.57 U	9.7 U	15 J	12.2 J	105 J	0.038 U	4.6 JX	12.7 U	4.96 JX	30.7 U	45.2 J	19.7
22-008-SW-2	208	12.5	26.4	20.5	6.83 U	631 J	8470 J	0.038 U	1200 JX	12.8	15.4 JX	30.7 U	2960 J	33.2
22-008-SW-3	92.5	13.6	22.9	17.1	10.9 J	424 J	4280 J	0.038 U	930 JX	12.7 U	15.2 JX	30.7 U	2570 J	35.7

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Wet Chemistry — Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-008-GW-1					
22-008-SW-1	72	< 5.0	< 5	< 0.05	NR
22-008-SW-2	114	< 5.0	47	< 0.05	NR
22-008-SW-3	137	< 5.0	47	< 0.05	NR

LEGEND

SE1 – Upgradient on Jack Creek.
SE2 – PPE – Adit #6 discharge after flowing through dump.
SE3 – Downgradient Jack Creek; approx. 100' below TP2.
TP1 – Composite of subsamples TP1A–A, B, C, and TP1B–A, B.
TP2 – Composite of subsamples TP2A–A, B, and TP2B–A, B.
TP3 – Composite of subsamples TP1A–D, 2A–C, and 2B–C.
WR1 – Composite of subsamples WR2B, 2C, and 3B.
WR2 – Composite of subsamples WR5A, 5B, and 3D.
BACKGROUND – From the Bullion Mine (22–008–SS–1).
TP1DUP – Duplicate of sample 22–008–TP–1.
GW1 – Adit discharge above mill.
SW1 – Same as sample SE1.
SW2 – Same as sample SE2.
SW3 – Same as sample SE3.

XRF ANALYSIS RESULTS

BULLION
PA NO. 22-008

MDSL AMRB/PIONEER 4/9/93

Mine Name: Bullion PA# 22-008
XRF Field Analyses
Results in PPM
Page 1 of 2.

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-008-SE-1000		15102.8	8778.78	2982.62		1866.1	41162.1		418.292	602.683	2913.69	236.418
22-008-SE-500		12129.1	4692.68	1211.91		755.969 *	23389.7		227.472	289.376	1235.23	253.435
22-008-SS-1		13005.2	7753.12	2573.54		3592.54	21627.7			145.953	51.5033 *	220.177
22-008-TP1A-A		14888.8	1525.33	935.952			11369.9		102.775 *	156.441	2355.33	39.2571
22-008-TP1A-B		27596.3	1757.26	1276.28			11499.6		129.646 *	169.999	2362.32	38.7682
22-008-TP1A-C		14283.9	1822.89	783.64		235.295 *	6298.27		374.028	745.121	2010.64	25.8496
22-008-TP1A-D		7101.55	13646	1829.35		589.639 *	22800.5	245.197 *		801.814	6897.75	238.637
22-008-TP1B-A		13271.3	1329.07	921.341			9162.36		59.9728 *	120.972	2406.4	38.0759
22-008-TP1B-B		14334.2	1555.28	951.155			8476.85		74.5145 *	220.944	1372.03	38.6036
22-008-TP2A-A		14931.8	1491.48	830.715			11213.5		82.6377 *	108.559 *	1928.82	40.2915
22-008-TP2A-B		13950.3	1345.55	783.222			7964.4		83.8262 *	80.4085 *	2890.54	31.3866
22-008-TP2A-C		24043.8	1705.76	937.409			14327.3		905.35	140.248	5063.77	33.9959
22-008-TP2B-A		39867.6	2125.9	1575.32			21440.9		313.555	224.27	4153.78	49.2368
22-008-TP2B-B		21227.6	1810.4	1162.13		267.214 *	17247.8		107.701 *	136.878	5208.9	40.3996
22-008-TP2B-C		33102.2	1899.55	1153.47			18431.8		508.861	227.399	3232.15	51.7336
22-008-TP-1-COMP		16747.9	1555.92	902.793			8404.11		146.362 *	365.098	1949.37	37.941
22-008-TP-2-COMP		30127	1890.11	1252.2			15367.9		155.204 *	124.848 *	3966.91	43.422
22-008-TP-3-COMP		29402.6	1855.34	999.226			15633		596.661	203.667	4198.8	46.1169
22-008-WR1-A		30409.9	5047.6	2268.85		427.33 *	30373.7			119.314 *		176.425
22-008-WR2-A		36820.2	2622.39	2230.5			15225		52.4265 *	71.6883 *	223.549	182.169
22-008-WR2-B		26567.5	1933.84	548.113			30281.8		93.5483 *	90.7565 *	16834.8	41.3937
22-008-WR2-C		28627.1	3241.05	1094.26		655.148 *	36795.8		100.32 *	118.175 *	15560.4	93.8795
22-008-WR3-A		17647.5	3575.08	1485.5		369.461 *	65188.1		134.392 *	341.095	7096.3	160.567
22-008-WR3-B		15055.8	14269.7	1659.83			81624.3		226.481	446.734	12153.2	274.148
22-008-WR3-C		32497.8	14360.2	1719.46		2782.26	28394.5			1724.8	288.48	64.0391
22-008-WR3-D		21490	14874.3	2023.28			39051.5		233.585	269.18	3631.04	148.2
22-008-WR5-A		31269.6	3265.49	799.563		450.861 *	25069.9		704.992	675.193	1414.09	44.01
22-008-WR5-B		30685.8	1900.27	682.992			14344.8		152.513 *	1857.03	744.401	35.0362
22-008-WR-1-COMP		21155.7	10166.8	1326.35			55813.9		89.3227 *	221.334	14078.3	171.21
22-008-WR-2-COMP		25925.8	5814.75	1141.94			26272.5		433.099	538.704	2166.13	60.7889
22-008-WR-6		20861.4	7609.08	2673.72		3729.26	53423.2		256.992	648.533	1724.37	239.712
22-008-WR-7		49303	1753.23	1377.46			14290.2			43.0223 *	567.368	29.741

Mine Name: Bullion PA# 22-008
XRF Field Analyses
Results in PPM
Page 2 of 2.

XRF SAMPLE ID	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-008-SE-1000	253.632		5.94663 *	626.636	178.222		111.762 *	377.244		17.4996 *	22.5071 *
22-008-SE-500	122.87			278.921	182.427			490.327	91.9084 *	15.4795 *	12.6485 *
22-008-SS-1	222.46				116.368			457.217			9.95701 *
22-008-TP1A-A	109.439		13.8947 *	2512.38	183.952		353.845	180.187			39.2881 *
22-008-TP1A-B	88.8893		16.0843 *	3390.19	212.479		444.487	164.863	103.73 *		41.8013 *
22-008-TP1A-C	71.7061		14.7654	1733.14	110.116		312.567	49.5765 *		12.8011 *	32.1039 *
22-008-TP1A-D	139.47			31.0419 *	147.354			422.714			15.5309 *
22-008-TP1B-A	118.144		11.3641 *	1911.58	137.985		269.281	142.761			33.8421 *
22-008-TP1B-B	199.247		12.3732 *	2797.17	147.258		358.381	189.937			34.166 *
22-008-TP2A-A	81.687		10.5041 *	1568.79	156.73		233.011	155.872			26.5395 *
22-008-TP2A-B	85.1917		17.2572	1921.16	130.453		207.121	64.0266			41.2214
22-008-TP2A-C	47.4371		32.0851	3405.58	220.829		391.174	80.9389		59.7333	72.5114
22-008-TP2B-A	63.3853		23.8018	7347.63	365.057		1058.79	265.326	206.512 *		58.2094 *
22-008-TP2B-B	94.5239		13.8375 *	3543.58	202.111		489.193	209.941	109.55 *		41.7694 *
22-008-TP2B-C	46.4926		35.786	4859.52	316.551		535.867	113.695		79.2339	82.6133
22-008-TP-1-COMP	106.268		16.0923	2647.62	164.061		415.428	154.783	83.3374 *		33.31 *
22-008-TP-2-COMP	94.3868		21.1199	3403.63	216.057		524.755	188.422			45.6837
22-008-TP-3-COMP	44.5417		30.5466	4118.89	267.685		409.744	82.3299	120.518 *	55.7288	68.9787
22-008-WR1-A	246.972			416.992	285.658			577.237	127.962 *	20.434 *	29.1726
22-008-WR2-A	264.143		6.59282 *	226.43	247.268			1329.25		22.2866 *	59.7847
22-008-WR2-B	144.89		17.0056 *	4167.43	241.704		1081.12	360.383	175.287 *		40.4971 *
22-008-WR2-C	186.838		9.90964 *	1520.6	238.515		574.185	504.243			26.9316 *
22-008-WR3-A	152.468		18.1877 *	770.826	244.773		104.409 *	363.216			56.9228
22-008-WR3-B	151.648			316.786	196.178		104.349 *	610.192			16.5783 *
22-008-WR3-C	120.939		5.02881 *	874.364	252.15			130.589			9.75437 *
22-008-WR3-D	152.046		8.67058 *	2645.06	263.973		241.493	290.668		14.1881 *	21.0367 *
22-008-WR5-A	123.403		10.917 *	3916.96	280.821		602.848	74.0109			33.548 *
22-008-WR5-B	84.5125		10.5797 *	5296.39	235.878		227.012	156.204	172.581 *		33.9342 *
22-008-WR-1-COMP	174.633		8.6431 *	1652.73	229.565		550.453	463.135	102.608 *		31.2438
22-008-WR-2-COMP	114.048		9.13975 *	3508.13	270.571		339.347	139.677	101.219 *		27.945 *
22-008-WR-6	200.473		22.4487	633.909	223.841			443.514		22.6695 *	24.2075 *
22-008-WR-7	155.181		11.8635 *	222.38	376.075		59.4995 *	196.578			14.2411 *

* - Estimated Quantity
$ - Unvalidated Data

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq

OLD DOMINION MINE

This site was visited, but no samples were collected.

EMERY MINE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q853	DDBS10L	0	U		2.65	B		0	U		0	U		112.92			0	U	

BULLION MINE & JACK CREEK TAILINGS

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q339	BBUS10M	0	U		5.43	B		44.77	B		1968			1.44	B		0	U	
92Q421	BBUS10M	0	U		5.2	B		39.16	B		1892.3			0.93	B		0	U	
92Q338	BBUS20L	0	U		0	U		3.62	B		12.34	B		4.83	B		0	U	
92Q418	BBUS20L	1.18	B		0	U		4.42	B		23.57	B		6.61	B		0.64	B	
92Q337	BBUS30M	0	U		0	U		21.66	B		373.25			2.56	B		0	U	
92Q419	BBUS30M	0	U		0	U		22.83	B		364.97			2.83	B		0	U	
92Q309	BBUS40L	0	U		0	U		4.89	B		31.73	B		2.22	B		0	U	
92Q414	BBUS40L	1.54	B		0	U		4.27	B		28.33	B		2.89	B		0	U	
92Q308	BBUS50H	2.45	B		41.49	B		4698			28230			166.22			0	U	
92Q316	BBUS60M	0	U		4.99	B		71.92			2216			1.3	B		0	U	
92Q413	BBUS60M	0	U		7.64	B		141.2			2685			1.72	B		0	U	
92Q317	BBUS70M	0	U		0	U		0	B		12.96	B		2.34	B		0	U	
92Q315	BBUS80L	0	U		0	U		2.51	B		17.03	B		1.23	B		0	U	
92Q415	BBUS80L	0	U		0	U		0	B		6.04	B		1.35	B		0	U	
92Q318	BBUS90M	0	U		0	U		0	B		6.71	B		0.92	B		0	U	
92Q420	BBUS90M	0	U		0	U		0	U		11.5	B		1.11	B		0	U	
92Q416	BBUSA0M	0	U		0	U		0	B		8.65	B		1.58	B		0	U	
92Q340	BBUSA0M	0	U		0	U		0	U		5.53	B		1.35	B		0	U	
92Q417	BBUSB0L	0	U		0	U		24.86	B		413.58			3.18	B		0	U	
92Q341	BBUSB0L	0	U		1.42	U		27.37	B		442.75			3.11	B		0	U	
92Q314	BBUSC0L	0	U		0	U		0	U		2.83	B		0	U		0	U	
92Q319	BBUSD0L	0	U		0	U		0	U		4.41	B		0	U		0	U	
92Q310	BBUSTRP	0	U		2.32	U		0	U		23.01	B		0	U		0	U	

OLD DOMINION MINE

This site was visited, but n

EMERY MINE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
92Q853	DDBS10L	0	U		11.29	B		0	U				

BULLION MINE & JACK CREE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
92Q339	BBUS10M	22.71			18.64	B		0.5	B		0.07	B	
92Q421	BBUS10M	20.25			14.8	B		0	U		0.05	B	
92Q338	BBUS20L	0	U		10.1	B		0.94	B		0.05	B	
92Q418	BBUS20L	0	U		14.57	B		0.82	B		0	U	
92Q337	BBUS30M	3.98	B		15.64	B		0	U		0.1	B	
92Q419	BBUS30M	3.83	B		18.74	B		0	U		0	U	
92Q309	BBUS40L	0	U		19.87	B		1.21	B		0.14	B	
92Q414	BBUS40L	0	U		23.19	B		1.4	B		0	U	
92Q308	BBUS50H	397.32			20.27	B		167.58			0.14	B	
92Q316	BBUS60M	20.55			14.05	B		0.53	B		0.12	B	
92Q413	BBUS60M	74.49			25.57	B		1.05	B		0	U	
92Q317	BBUS70M	0	U		41.37	B		0	U		0.12	B	
92Q315	BBUS80L	0	U		34.95	B		0	U		0.19	B	
92Q415	BBUS80L	0	U		44.64	B		0.72	B		0	U	
92Q318	BBUS90M	0	U		31.24	B		0	U		0.15	B	
92Q420	BBUS90M	0	U		35.92	B		0	U		0	U	
92Q416	BBUSA0M	0	U		42.33	B		0	U		0	U	
92Q340	BBUSA0M	0	U		37.49	B		0	U		0.15	B	
92Q417	BBUSB0L	4.45	B		22.14	B		0	U		0	U	
92Q341	BBUSB0L	4.64	B		18.75	B		0	U		0.07	B	
92Q314	BBUSC0L	0	U		4.61	B		0	U		0.12	B	
92Q319	BBUSD0L	0	U		0	U		0	U		0	U	
92Q310	BBUSTRP	0	U		0	U		0.55	B		0.05	B	

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
TOTAL RECOVERABLE METALS: (ppb)																			
92Q1128	BBUS10M	0	U		5.33	B		243.42			2308			20.24			0	U	
92Q1125	BBUS20L	0	U		0	U		3.11	B		13.17	B		8.36	B		0	U	
92Q1126	BBUS30M	0	U		0	U		51.69			429.78			8.67	B		0	U	
92Q1121	BBUS40L	0	U		0	U		3.72	B		18.13	B		3.02	B		0	U	
92Q1120	BBUS60M	0	U		6.71	B		358.47			3138			36.9			0	U	
92Q1122	BBUS80L	0	U		0	U		0	U		0	U		2.55	B		0	U	
92Q1127	BBUS90M	0	U		0	U		0	U		6.99	B		2.05	B		0	U	
92Q1123	BBUSA0M	0	U		0	U		0	U		0	U		2.48	B		0	U	
92Q1124	BBUSB0L	0	U		0	U		54.55			450.43			9.23	B		0	U	
TOTAL METALS: (ppm)																			
92S311	BBUD10H	2.70	B		2.01	B		309.47			1937.00			7835.00			30.92		
92S312	BBUD20H	0.00	U		1.37	B		49.19	B		86.56			794.20			5.14	B	
92S320	BBUD30L	4.07	B	N	1.23	B	N	398.73		N	1055.62			10979.29			33.56		N
92S321	BBUD40L	0.00	U	N	0.94	B	N	0.00	U	N	0.00	U		5.82	B		0.00	U	N
92S322	BBUD50L	0.00	U	N	0.00	U	N	0.00	U	N	6.92	B		0.00	U		0.00	U	N
92S313	BBUDTRP	0.00	U		0.00	U		0.00	U		13.72	B		0.00	U		0.00	U	

ENTERPRISE AND BUCKEYE MINES

DISSOLVED METALS: (ppb)																			
92Q346	BBAS10H	2.79	B		19.40	B		609.00			15020.00			3438.05			0.00	U	
92Q345	BBAS20L	0.00	U		0.00	U		3.69	B		10.69	B		2.36	B		0.00	U	
92Q344	BBAS30H	2.36	B		15.41	B		1879.00			15730.00			235.31			0.72	B	
92Q355	BBAS40L	0.00	U		2.37	U		12.88	B		152.50			20.16			0.00	U	
92Q366	BBAD40L																		
TOTAL METALS: (ppm)																			
92S347	BBAD10H	2.40	B	N	0.00	U	N	238.40		N	117.00			4568.00			58.66		N
92S356	BBAD20H	5.95	B	N	3.86	B	N	149.43		N	259.75			7698.00			28.17		N
92S357	BBAD30H	4.02	B	N	2.82	B	N	95.56		N	137.51			9173.00			22.22		N
92S367	BBAS50L	0.00	U	N	0.00	U	N	0.00	U	N	6.90	B		0.00	U		0.00	U	N

CRYSTAL MINE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
TOTAL RECOVERABLE METALS: (ppb)													
92Q1128	BBUS10M	18.18			16.83	B		7.85			0.07	B	
92Q1125	BBUS20L	0	U		31.65	B		0.54	U		0.08	B	
92Q1126	BBUS30M	2.34	B		18.93	B		1.64	B		0.07	B	
92Q1121	BBUS40L	0	U		16.2	B		0	U		0.08	B	
92Q1120	BBUS60M	26.44			18.06	B		12.66			0.08	B	
92Q1122	BBUS80L	0	U		38.89	B		0	U		0.08	B	
92Q1127	BBUS90M	0	U		41.15	B		0	U		0.08	B	
92Q1123	BBUSA0M	0	U		42.19	B		0	U		0.06	B	
92Q1124	BBUSB0L	2.31	B		19.88	B		1.42	B		0.08	B	
TOTAL METALS: (ppm)													
92S311	BBUD10H	8.90	B		53.66	B		5356.00			2.37		
92S312	BBUD20H	1.30	B		40.94	B		504.37			0.70		
92S320	BBUD30L	8.13	B	N	85.00	B	N	2445.77			1.71		
92S321	BBUD40L	0.51	B	N	0.00	U	N	3.27	B		0.21	B	
92S322	BBUD50L	0.58	B	N	0.00	U	N	0.00	U		0.25	B	
92S313	BBUDTRP	0.51	B		0.00	U		0.00	U		0.23	B	
ENTERPRISE AND BUCKEYE													
DISSOLVED METALS: (ppb)													
92Q346	BBAS10H	119.50			22.24	B		1173.66			0.00	U	
92Q345	BBAS20L	0.00	U		12.62	B		0.00	U				
92Q344	BBAS30H	156.82			10.31	B		128.37					
92Q355	BBAS40L	1.54	B		12.59	B		11.20			0.11	B	
92Q366	BBAD40L										0.07	B	
TOTAL METALS: (ppm)													
92S347	BBAD10H	5.43	B	N	140.98	B	N	4029.00			0.68		
92S356	BBAD20H	3.42	B	N	59.93	B	N	5841.00			1.10		
92S357	BBAD30H	1.99	B	N	63.20	B	N	3946.00			0.83		
92S367	BBAS50L	0.00	U	N	0.00	U	N	0.00	U		0.37	B	

CRYSTAL MINE

DISSOLVED METALS: (ppb)

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

BULLION
PA NO. 22-008

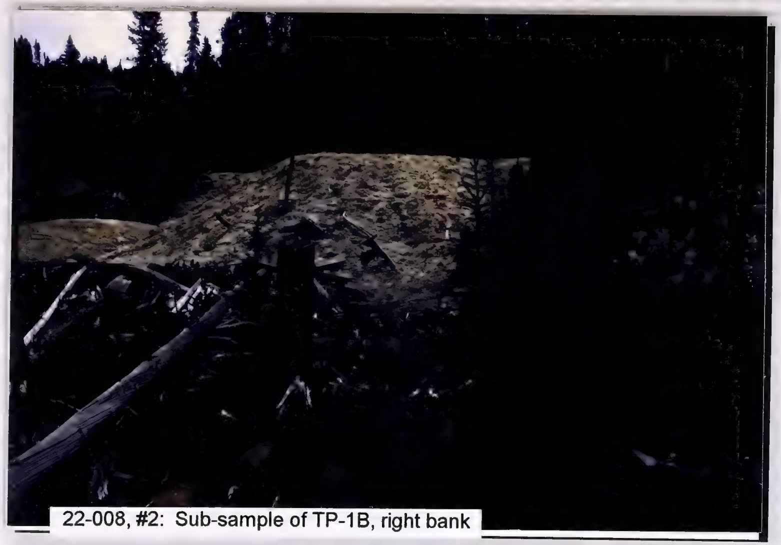
AIMSS SCORESHEET

SITE NAME: BULLION
PA NUMBER: 22-008

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	509.693
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		9
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	9.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	1834895
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	533.276
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	19
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	8105795
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.466
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	20
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	4466
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.273
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 - 42	5
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	3205
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**99.48**

			SITE NAME:	BULLION
			PA NUMBER:	22-008

LINE NO.		SITE SAFETY		
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	[illegible]
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	225
5		HAZ. STRUCTURES	40 EA.	200
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	425
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	5
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**42.50**



22-008, #2: Sub-sample of TP-1B, right bank

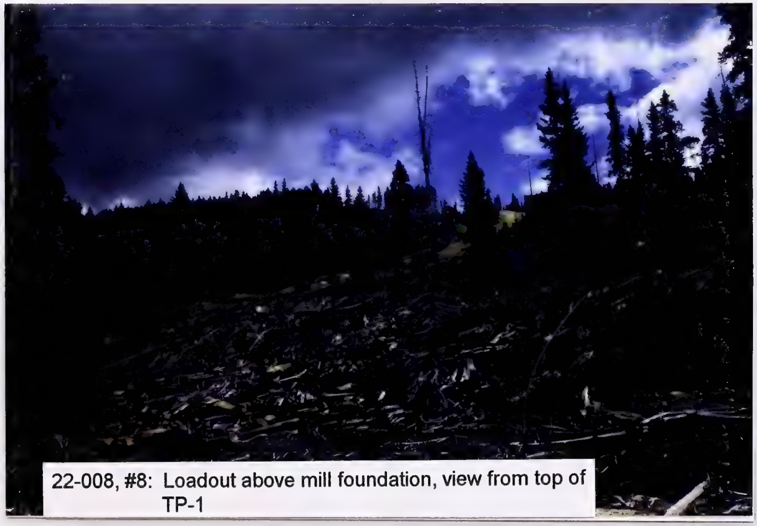
22-008, #3: TP-1B, right bank

22-008, #4: TP-2A

22-008, #5: TP-2B

22-008, #6: SW-1 sample location

22-008, #7: SW-2 sample location


22-008, #8: Loadout above mill foundation, view from top of TP-1

22-008, #9: SW-3 sample location

22-008, #10: WR-7

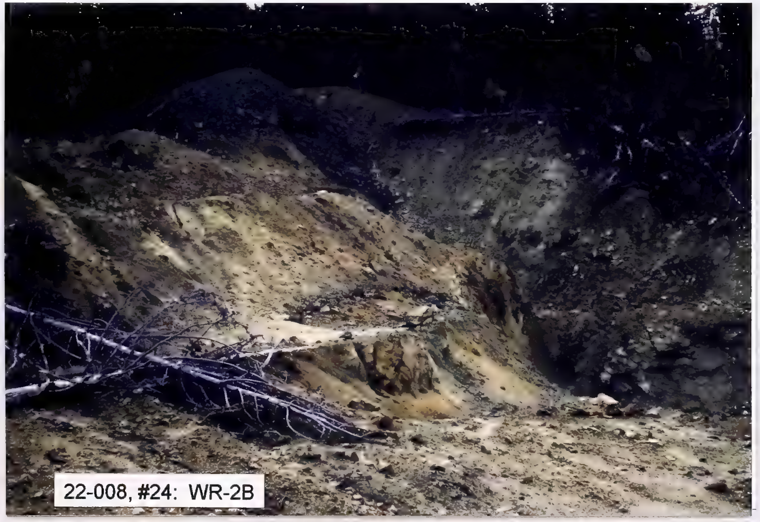
22-008, #11: Collapsed adit with discharge

22-008, #12: Mill, loadout, and flotation cell from road

22-008, #13: WR-5

22-008, #14: WR-6 and trenching

22-008, #23: WR-2A



22-008, #24: WR-2B

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: BASIN MILLSITE **PA#:** 22-036

Date: July 9, 1993 **Time:** 1200

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: Mr. Frank Watkins, Caretaker

Weather/Seasonality Observations: Warm (60°-65°F); breezy (5-10 mph); partly cloudy; cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #25: Ore stockpiles; #26: Tailings pond. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Tailings could be reprocessed for metals or should be removed. Ore stock piles could be reprocessed for Pb and Zn.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BASIN MILLSITE PA#: 22-036

Legal Description: T 6N ;R 5W ;Sec. 17 , NE1/4 SW1/4 ___1/4

County: JEFFERSON Mining District: BASIN

Latitude: N 46° 16' 17" Longitude: W 112° 15' 18"

Primary Drainage Basin and Code: Boulder River/10020006
Secondary Drainage Basin: Basin Creek

USGS Quadrangle map name(s): Basin

Mine Type/Commodities: Millsite/Custom mill

Activity Status: Active___,Inactive/Exploration X ,Abandoned___.

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact (Include address and phone when available): Paul Smith, OT Mining, 107 South Main, Boulder, MT 59632. (406) 225-3703.

Relationship to other mines/sites in the area/district: Received ore from mines in district.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? No hardrock permit; bond was revoked in 1992. Groundwater pollution control permit is valid until May of 1994.

General site features: Elevation 5400', Slope 10°,
Aspect South

Land use: Mining___, Recreational___, Residential X , Urban___,
Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? Approx. 2 acres.
Dimensions:

Predominant vegetation types: Weeds, grasses

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites).
Locked cable gate

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 17 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Ore was from the Basin/Cataract districts. The Boulder River is to the south of the site and Cataract Creek is to the east.

Mining/milling history, ore type/tenor, host rock, gangue: Mill operation from unknown date to 1990.

Mine Operation?
Shafts - Yes___, No X, # ____, Comment____
Adits - Yes___, No X, # ____, Comment____
Pits - Yes___, No X, # ____, Comment____
Placers - Yes___, No X, # ____, Comment____
Other - Yes___, No X, # ____, Comment____

Mill Operation? Yes X, No____. If yes answer the next three questions:

Period(s) of Operation: Unknown to 1990

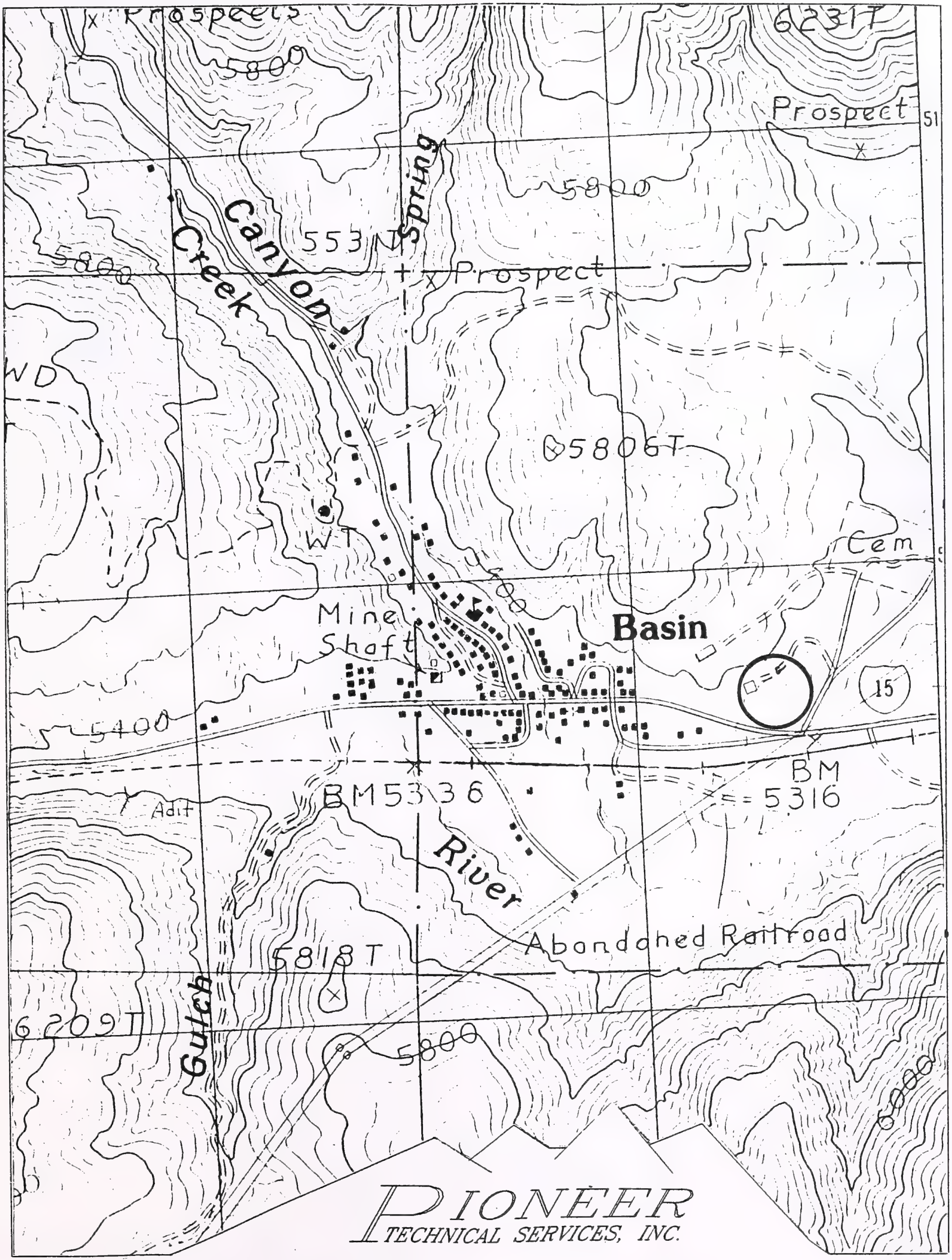
Origin of Ore Milled - Custom Mill X Dedicated Mill___; Number and names of mines that supplied mill feed: Mines from Basin/Cataract including the Comet mine

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
CN- leach

Montana Bureau of Mines and Geology
Water Well Log Data

11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M:53420	06N 05W 07 DCB	25.0	30.0	10.00
M:53421	06N 05W 16	160.0	30.0	60.00
M:53424	06N 05W 17	28.0	5.0	20.00
M:53422	06N 05W 17	25.0	60.0	15.00
M:53425	06N 05W 17	45.0	15.0	8.00
M:53423	06N 05W 17	110.0	10.0	20.00
M:53426	06N 05W 17 C	30.0	0.0	4.00
M:53428	06N 05W 17 CB	123.0	8.0	30.00
M:131806	06N 05W 17 CB	31.0	20.0	16.00
M:53427	06N 05W 17 CB	0.0	2.0	15.00
M:53430	06N 05W 18	25.0	65.0	0.00
M:53434	06N 05W 18	40.0	20.0	38.00
M:53433	06N 05W 18	16.0	20.0	0.00
M:53431	06N 05W 18	21.0	20.0	5.00
M:53429	06N 05W 18	27.0	60.0	14.00
M:53432	06N 05W 18	30.0	30.0	10.00
M:53435	06N 05W 18 ADA	100.0	200.0	17.00

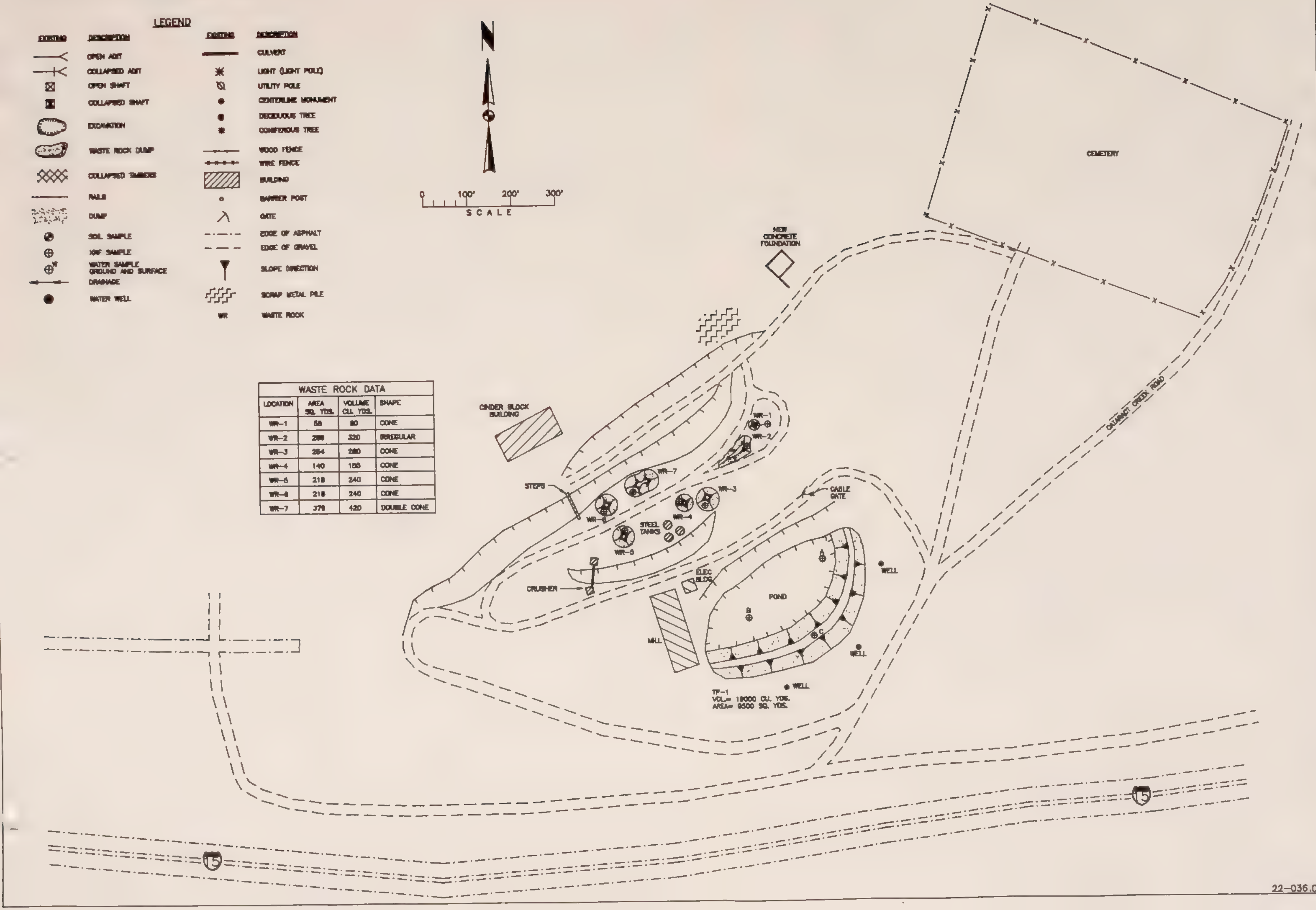


PIONEER TECHNICAL SERVICES, INC.

BASIN MILL, P.A. NO. 22-036

T06N, R05W, SECTION 17

SCALE: 1" = 1000'



LEGEND

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
—<	OPEN ADIT	▬	CULVERT
—+<	COLLAPSED ADIT	✳	LIGHT (LIGHT POLE)
⊠	OPEN SHAFT	⌀	UTILITY POLE
■	COLLAPSED SHAFT	●	CENTERLINE MONUMENT
⬭	EXCAVATION	●	DECIDUOUS TREE
⬭	WASTE ROCK DUMP	✱	CONIFEROUS TREE
⨯⨯⨯	COLLAPSED TIMBERS	—•—	WOOD FENCE
——	RAILS	-•-•-	WIRE FENCE
⁘	DUMP	▨	BUILDING
◕	SOIL SAMPLE	○	BARRIER POST
⊕	XRF SAMPLE	⋏	GATE
⊕ᵂ	WATER SAMPLE GROUND AND SURFACE	-·-·-	EDGE OF ASPHALT
—→—	DRAINAGE	- - -	EDGE OF GRAVEL
●	WATER WELL	▼	SLOPE DIRECTION
		≋	SCRAP METAL PILE
		WR	WASTE ROCK

WASTE ROCK DATA			
LOCATION	AREA SQ. YDS.	VOLUME CU. YDS.	SHAPE
WR-1	56	60	CONE
WR-2	288	320	IRREGULAR
WR-3	264	280	CONE
WR-4	140	155	CONE
WR-5	218	240	CONE
WR-6	218	240	CONE
WR-7	378	420	DOUBLE CONE

DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

PIONEER TECHNICAL SERVICES INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

BASIN MILL SITE PA# 22-036
BASIN DISTRICT JEFFERSON COUNTY

SHEET NO.

22-036.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Top is fine sand (0-3'); middle is mixed fine sand/clay (3-6'); bottom is clay (6-8'); possible liner.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Maximum depth is 8 feet.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Wet

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Impoundment is sound.

Comments on potential for mitigation: Still operable; if it becomes abandoned, reprocess the tailings and waste rock.

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	80	East end of pile	None	4.8 (D)	0.05	22-036-WR-1	07/09/93 1930	T-Metals, ABA
WR-2	WR	320	West of WR-1	None	3.85 (D)	0.08	22-036-WR-2	07/09/93 1940	T-Metals, ABA
WR-3	WR	280	West side of pile	None	5.4 (D)	0.06			
WR-4	WR	155	West side of pile	None	< 3.5 (D)	0.04			
WR-5	WR	240	West end of dump near crusher; top of pile	None	5.2 (D)	0.08			
WR-6	WR	240	East of steps; top of pile	None	< 3.5 (D)	0.05			
WR-7	WR	420	Northwest of steel tanks; top of pile	None	5.6 (D)	0.05			
TP-1A-A	TAIL	19,000	East end of TP-1; 0-3'	Possible clay liner and well established berm	6.2 (D)	0.03	22-036-TP-1	07/09/93 1930	T-Metals, ABA, CN-
TP-1A-B	TAIL		East end of TP-1; 3-6'	Possible clay liner and well established berm	6.2 (D)	0.03			
TP-1A-C	TAIL		East end of TP-1; 6-8'	Possible clay liner and well established berm	5.6 (D)	0.04			
TP-1A-D	TAIL		East end of TP-1; 8', underlying soil	Possible clay liner and well established berm	4.0 (D)	0.04			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-036-WR-1 and 22-036-WR-2 are both composites of WR-1 through WR-7. 22-036-TP-1 is composite of TP-1A-A and -1A-B, and TP-1B-A and -1B-B.

*Continued on next page

SOURCE INVENTORY FORM (Cont'd)

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1B-A	TAIL		Middle of TP-1; 0-2', moist sand	Possible clay liner and well established berm	6.0 (D)	0.04			
TP-1B-B	TAIL		Middle of TP-1; 2-3', moist gray sand	Possible clay liner and well established berm	6.0 (D)	0.04			
TP-1C-A	TAIL		West end of pile; 0-3', moist sand	Possible clay liner and well established berm	6.0 (D)	0.04	22-036-TP-2	07/09/93 1940	T-Metals, ABA, CN-
TP-1C-B	TAIL		West end of pile; 3-6', moist gray sand	Possible clay liner and well established berm	5.5 (D)	0.05			
TP-1C-C	TAIL		West end of pile; 6-8', gray clay	Possible clay liner and well established berm	5.5 (D)	0.04			

*D-Direct reading(Kelvey Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-036-TP-2 is composite of TP-1A-C, and TP-1C-A through -1C-C.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:______________

Filled shafts: Yes___, No_X_, Number:____ Identification:______________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_32___

Distance to nearest well used for drinking?_< 0.5 mile_______

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible_X__, Unlikely____.
Sources that may not be contained with elevated lead and zinc; however depth to water is approx. 53 feet below ground surface.

Other observations/notes: There are three monitoring wells on-site. Well No. 1 has a SWL of 52.3 feet and a TD of 152 feet. Well No. 2 has a SWL of 55.8 feet and a TD of 75 feet. Well No. 3 has a SWL of 55.8 feet and a TD of 150 feet.

GROUNDWATER INVENTORY FORM

SAMPLERS: ________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X , Name(s):

Dry streambeds: Yes____, No X , Name(s):

Other surface water: Yes____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes____, No X Source ID(s):

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

Distance between waste source(s) and nearest surface water body (ft)?
1,000 feet to Boulder River from TP-1

Surface water draining onto or through waste sources: Yes____, No X ,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
N/A

Observed erosional/sedimentation/stream turbidity problems? Yes____, No X , Distance downstream (ft)?________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
N/A

SURFACE WATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.											

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? N/A

Wetlands present: Yes___, No_X_, Describe:

Carbonate rocks/soils: Yes___, No_X_, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000_X_; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? < 0.5 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	pH	Partial	495	495	No	Low
WR-2	pH	Partial	2,601	2,601	No	Low
WR-3	None	Partial	2,286	2,286	No	Low
WR-4	pH	Partial	1,260	1,260	No	Low
WR-5	pH	Partial	1,962	1,962	No	Low
WR-6	pH	Partial	1,962	1,962	No	Low
WR-7	None	Partial	3,411	3,411	No	Low
TP-1	SO3	Wet	85,500	85,500	Yes	Moderate

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_X_, No____
Describe: Mechanic shop approx. 200 feet

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000_X_; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments____________________

Evidence of recreational use on site: Yes___, No_X_, Describe:________

Accessibility - Fences, warning signs, closed roads? Cable gate

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes___, No_X_, Comment__________
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:___

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:__________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:__________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:__________

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/WQB, Groundwater Monitoring Permit, Monthly Sampling Data, 1984-1993.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Basin Creek Millsite, Prepared by Northern Engineering and Testing, July 28, 1988.

USGS, Topographic Map, Basin, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

BASIN MILLSITE
PA NO. 22-036

Basin Millsite PA# 22-036
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 07/09/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-036-TP-1	39 JX	43.5	0.5 U	3.6	11.9	25.5	10700	0.014 J	1360 J	4	102	6 UJ	135	0.308 U
22-036-TP-2	2840 JX	350	27.7	9.3	10.8	252	26900	0.585 J	5050 J	11	3340	37 J	4460	0.302 U
22-036-WR-1	232 JX	64.1	38.5	4.9	1.7	963	18900	0.493 J	672 J	6	11900	329 J	3770	NR
22-036-WR-2	139 JX	59.1	103	4.4	7.4	342	17300	0.517 J	1370 J	4	2190	35 J	12500	NR
BACKGROUND	15	65.1	0.5 U	4	6.3 J	10.3 J	9160	0.01 J	344 J	6	11 JX	7 UJ	94	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-036-TP-1	<0.01	0	94.4	94.4	<0.01	<0.01	0.04	0	94.4
22-036-TP-2	1.69	52.8	114	61.2	0.34	1.12	0.23	35	79
22-036-WR-1	2.91	90.9	3.63	-87	<0.01	2.16	0.84	67.5	-63.8
22-036-WR-2	2.19	68.4	9.8	-59	0.85	0.63	0.71	19.7	-9.88

LEGEND

TP1 - Composite of subsamples TP1A-A, -B, 1B-A, and -B.
TP2 - Composite of subsamples TP1A-C, 1C-A, 1C-B, and 1C-C.
WR1 - Composite of subsamples WR1, 2, 3, 4, 5, 6, and 7.
WR2 - Same as sample 22-036-WR-1. (Split)
BACKGROUND - From Morning Glory Mine (22-077-SS-1).

XRF ANALYSIS RESULTS

BASIN MILLSITE
PA NO. 22-036

Mine Name: Basin Millsite PA# 22-036
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-036-TP1A-A		15526.8	41084.1	593.715		1198.29	8510.8		55.9715 *	73.201 *		342.547
22-036-TP1A-B		19337.3	38316.9	927.252		1639.5	15198.6			167.802	54.1938 *	462.115
22-036-TP1A-C		37908.3	13475.9	1179.07		5545.27	24532.9		238.715	2394.96	5128.25	114.255
22-036-TP1A-D		17767.3	14877.8	820.132		1557.53	12612.7		135.133 *	352.091	55.6356 *	879.532
22-036-TP1B-A		17130.4	39660.9	476.425		1205.77	8538.91			101.183 *	46.1773 *	417.328
22-036-TP1B-B		24965.2	49868.3	1152.93		2332.88	15503.2			170.963	44.9574 *	448.61
22-036-TP1C-A		16265.5	45287.8	958.879		8125.36	29875.7		167.465 *	3922.73	2372.33	136.039
22-036-TP1C-B		15056.9	51167.8	871.939		12198.7	29522.5		134.95 *	7216.09	1999.82	114.585
22-036-TP1C-C		29136.2	15570.5	1179.91		4018.73	22904.8		246.02	2691.15	2699.63	114.708
22-036-TP-1-COMP		18956.4	23401.9	784.324	182.551 *	6120.72	22157.2		176.382 *	3215.57	2155.8	99.1516
22-036-TP-2-COMP		17631.8	42406	686.662	189.504 *	1450.98	11279.9			144.281 *	46.8669 *	392.125
22-036-WR-1		35945.2	3147.11	1932.99		159.878	14751.3	204.582	692.156	3278.58		98.4262
22-036-WR-1-COMP		23618.2	7550.32	1299.01		1133.4	19411.8		273.131	2518.36		107.079
22-036-WR-2		27931.8	3034.53	1164.35		1011.48 *	23047.8		312.259	7412.73		52.9256
22-036-WR-2-COMP		22135.3	6718.21	1119.14	163.579 *	969.203 *	18798.3		360.632	3025.95		95.5258
22-036-WR-3		20400.2	7184.4	1234.51			21948.8		143.635 *	345.716		127.862
22-036-WR-4		17964.7	4142.05	954.459			17414.1		124.474 *	641.407		21.2157 *
22-036-WR-5		21937.7	27732	1128.21	184.437 *	6353.22	34606.5		546.365	5019.52	1181.45	142.763
22-036-WR-6		23796.7	7199.87	1940.23	130.182 *		14995.5		443.329	3950.86		140.628
22-036-WR-7		24374	3260.97	928.8		373.164 *	19166.6		281.076	1637.49		87.8033

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-036-TP1A-A	79.9858		6.46385 *	26.3762 *	111.428			559.609		12.1424 *	
22-036-TP1A-B	62.93		6.05153 *	62.8252 *	137.114			647.105	106.154 *		
22-036-TP1A-C	107.955		10.1157 *	4529.32	297.373		71.1425 *	323.904	141.653 *	22.187 *	22.6902 *
22-036-TP1A-D	128.462			37.316 *	64.7195			1043.54			8.178 *
22-036-TP1B-A	58.9801			32.0491 *	112.501			508.449			
22-036-TP1B-B	71.5154		4.61464 *	71.2095 *	156.327	129.876 *		697.076			
22-036-TP1C-A	97.3331		10.3748 *	1055.16	100.927		65.6818 *	338.289		20.0911 *	
22-036-TP1C-B	71.1429		8.80042 *	1246.92	115.97		60.6537 *	330.484		13.1401 *	
22-036-TP1C-C	126.08		19.5721	3333.04	225.298	185.306 *	107.86 *	459.711			21.8343 *
22-036-TP-1-COMP	102.022		15.927 *	2054.26	146.313		74.7986 *	338.731	113.793 *		17.4273 *
22-036-TP-2-COMP	63.2953		4.43722 *	71.3568	124.142			527.918			
22-036-WR-1	220.993		7.49997	1435.02	242.838	88.8602	141.086	422.146	129.638	26.0186	17.6886
22-036-WR-1-COMP	173.221		8.26358 *	1886.82	191.031		89.3111 *	372.634	207.742 *	19.9062 *	19.1055 *
22-036-WR-2	166.12		7.01871 *	3547.72	216.58	214.021 *	73.325 *	253.67	136.769 *	23.2342 *	22.8636 *
22-036-WR-2-COMP	159.659		11.7135 *	2064.31	170.725	115.852 *	109.876 *	331.519	112.546 *	19.9404 *	17.0084 *
22-036-WR-3	161.25		9.76259 *	891.937	163.013		46.568 *	446.251		24.5942 *	21.0326 *
22-036-WR-4	125.717		9.79655 *	4032.18	142.869		48.7101 *	67.5185		14.727 *	24.9402 *
22-036-WR-5	115.49		24.1077	1692.17	162.036		121.29 *	322.367	100.474 *	70.3373	
22-036-WR-6	258.152		7.87698 *	1318.46	196.489		120.115 *	760.631	117.863 *	23.2236 *	18.2227 *
22-036-WR-7	138.143		23.1682	1414.17	182.599		62.1098 *	227.309		28.6976 *	14.2567 *

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

BASIN MILLSITE
PA NO. 22-036

AIMSS SCORESHEET

SITE NAME: BASIN MILLSITE
PA NUMBER: 22-036

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	23.515
6	GW - TARGETS	WELLS - 1 MI. x 2.5		42.5
7		WELLS - 1 TO 4 MI		15
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	62.5
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	293938
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	25.080
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	18058
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.836
29	AIR - TARGETS	POPULATION - 4 MILES		300
30		NEAREST RESIDENCE		5
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	315
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	26334
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		200
37A		ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	250
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.784
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		300
41		NEAREST RESIDENCE		5
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	305
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	59780
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**3.98**

SITE NAME: BASIN MILLSITE
PA NUMBER: 22-036

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		300
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	305
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES

File

August 16, 1993

CLIENT: O.T. Mining

DATE SAMPLED: 07-31-93

DATE RECEIVED: 08-02-93

FIELD	MSE, INC. LAB NO.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm@25° C
Well #1	WL019	6.41	131	268
Well #2	WL020	8.39	283	564
Well #3	WL021	6.27	173	277

RECEIVED
AUG 24 1993
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WATER QUALITY BUREAU

Review

file

July 20, 1993

CLIENT: O.T. Mining

DATE SAMPLED: 06-29-93

DATE RECEIVED: 07-01-93

FIELD	MSE, INC. LAB NO.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm@25°C	results in mg/L		
					Diss. Cd	Diss. Cu	Diss. Zn
Well #1	WK434	6.15	192	269	0.0008	0.025	0.037
Well #2	WK435	8.35	320	543	0.0003	0.002	<0.006
Well #3	WK436	6.04	205	286	0.0011	0.007	0.115

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JUL 27 1993
MONT. DEPT. OF HEALTH & ENV. SCIENCES
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REPORT DATE: January 7, 1992

CLIENT: O.T. MINING

1992 Data

DATE SAMPLED: 12/18/91

DATE RECEIVED: 12/19/91

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm @ 25 °C	Results in mg/L D-Cd	D-Cu	D-Zn
Well #1	WC103	6.65	169	260	<0.0002	0.010	0.068
Well #2	WC104	8.62	350	566	<0.0002	0.005	0.038
Well #3	WC105	6.61	164	251	<0.0002	0.015	0.182

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Metals Review

T. T. file MSWPCS

REPORT DATE: February 4, 1992

CLIENT: O.T. MINING

DATE SAMPLED: 01/27/92

DATE RECEIVED: 01/29/92

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	SC µmhos/cm @ 25 °C
Well #1	WC506	6.51	200	278
Well #2	WC507	8.68	368	585
Well #3	WC508	6.54	196	263

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02/04/92

Anion Review

REPORT DATE: March 5, 1992

CLIENT: O.T. MINING

DATE SAMPLED: 02/26/92

DATE RECEIVED: 02/27/92

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	SC µmhos/cm @ 25 °C
Well #1	WC866	6.27	190	277
Well #2	WC867	8.64	345	593
Well #3	WC868	6.30	177	271

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MAR 11 1992
MONT. DEPT. OF HEALTH & ENV. SCIENCES
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Review

REPORT DATE: April 22, 1992

CLIENT: O.T. MINING

DATE SAMPLED: 03/26/92

DATE RECEIVED: 03/27/92

(Results in mg/L)

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	SC (μmhos/cm at 25°C)	Diss-Cd	Diss-Cu	Diss-Zn
Well #1	WD174	6.51	195	273	<0.0001	<0.001	0.035
Well #2	WD175	8.63	359	569	<0.0001	0.002	<0.004
Well #3	WD176	6.42	184	264	0.0003	0.005	0.152

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APR 28 1992
MONT. DEPT. OF HEALTH & ENV. SCIENCES
WATER QUALITY BUREAU

Rob Ball

Anion Review

Tim:
file

REPORT DATE: May 14, 1992

CLIENT: O.T. MINING

DATE SAMPLED: 04/27/92

DATE RECEIVED: 04/29/92

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity (μmhos/cm at 25°C)
Well #1	WD506	6.45	198	267
Well #2	WD507	8.68	355	579
Well #3	WD508	6.46	194	269

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MAY 19 1992
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Anion Review

Jim / Terry File

REPORT DATE: June 9, 1992

CLIENT: O.T. MINING

DATE SAMPLED: 05/28/92

DATE RECEIVED: 06/01/92

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity (µmhos/cm at 25°C)
Well #1	WD975	6.63	167	271
Well #2	WD976	8.45	344	595
Well #3	WD977	6.45	165	270

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Anion Review

REPORT DATE: July 27, 1992

CLIENT: O.T. MINING

DATE SAMPLED: 06/29/92

DATE RECEIVED: 07/01/92

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity (μmhos/cm at 25°C)	Diss-Cd	Diss-Cu	Diss-Zn
Well #1	WE368	8.14	168	257	0.0005	0.006	0.049
Well #2	WE369	8.15	346	564	<0.0001	<0.004	0.006
Well #3	WE370	7.51	204	264	0.0003	0.153	0.133

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REPORT DATE: August 7, 1992

CLIENT: O.T. MINING

DATE SAMPLED: 07/29/92

DATE RECEIVED: 07/30/92

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity (μmhos/cm at 25°C)
Well #1	WE679	6.53	168	265
Well #2	WE680	8.53	349	586
Well #3	WE681	6.46	172	257

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Review:

WELL NO. 2 (Collar Elevation = 5324.16 Feet Above Sea level)

Date Monitored	Static Water Level From Collar	Water Level Elevation	Water Level Change From Previous Month	Remarks
19-Dec-89	55.38	5268.78	-----	Monthly and Quarterly Sa
04-Jan-90	56.35	5267.81	-0.97	Monthly Sampling
22-Feb-90	57.20	5266.96	-0.85	Monthly Sampling
25-Mar-90	55.45	5268.71	1.75	Monthly and Quarterly Sa
24-Apr-90	55.37	5268.79	0.08	Monthly Sampling
22-May-90	55.27	5268.89	0.10	Monthly Sampling
27-Jun-90	54.13	5270.03	1.14	Monthly and Quarterly Sa
24-Jul-90	55.02	5269.14	-0.89	Monthly Sampling
27-Aug-90	56.10	5268.06	-1.08	Monthly Sampling
28-Sep-90	56.36	5267.80	-0.26	Monthly and Quarterly Sa
23-Oct-90	57.46	5266.70	-1.10	Monthly Sampling
19-Nov-90	57.48	5266.68	-0.02	Monthly Sampling
27-Dec-90	57.38	5266.78	0.10	Monthly and Quarterly Sa

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[illegible]	[illegible]	5264.12	-0.88	Monthly Sampling
[illegible]	[illegible]	5264.05	-0.07	Monthly Sampling
[illegible]	[illegible]	5265.55	1.50	Monthly and Quarterly
[illegible]	62.02	5265.77	0.22	Monthly Sampling
[illegible]	62.03	5265.76	-0.01	Monthly Sampling
[illegible]-92	62.41	5265.38	-0.38	Monthly and Quarterly
[illegible]-Jul-92	62.94	5264.85	-0.53	Monthly Sampling
26-Aug-92	64.18	5263.61	-1.24	Monthly Sampling
26-Sep-92	63.78	5264.01	0.40	Monthly and Quarterly
28-Oct-92	64.47	5263.32	-0.69	Monthly Sampling

File John

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Subject: Tailing Pond Monitor Wells
Location: Basin Mill - Basin, Montana

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WATER QUALITY BUREAU

WELL NO. 1 (Collar Elevation = 5327.79 Feet Above Sea level)

Date Monitored	Static Water level From Collar	Water Level Elevation	Water level Change From Previous Month	Remarks
19-Dec-89	63.48	5264.31	-----	Monthly and Quarterly
04-Jan-90	64.75	5263.04	-1.27	Monthly Sampling
22-Feb-90	55.05	5272.74	9.70	Monthly Sampling
25-Mar-90	54.57	5273.22	0.48	Monthly and Quarterly
24-Apr-90	54.41	5273.38	0.16	Monthly Sampling
22-May-90	62.40	5265.39	-7.99	Monthly Sampling
27-Jun-90	61.10	5266.69	1.30	Monthly and Quarterly
24-Jul-90	63.21	5264.58	-2.11	Monthly Sampling
27-Aug-90	64.30	5263.49	-1.09	Monthly Sampling
28-Sep-90	64.36	5263.43	-0.06	Monthly and Quarterly
23-Oct-90	64.72	5263.07	-0.36	Monthly Sampling
19-Nov-90	64.88	5262.91	-0.16	Monthly Sampling
27-Dec-90	64.80	5262.99	0.08	Monthly and Quarterly

over

John

C.T. MINING CORPORATION

Subject: Tailing Pond Monitor Wells
Location: Basin Mill - Basin, Montana

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WATER QUALITY BUREAU

W E L L N O. 1 (Collar Elevation = 5327.79 Feet Above Sea Level)

Date Monitored	Static Water Level From Collar	Water Level Elevation	Water Level Change From Previous Month	Remarks
19-Dec-89	63.48	5264.31	-----	Monthly and Quarterly
04-Jan-90	64.75	5263.04	-1.27	Monthly Sampling
22-Feb-90	55.05	5272.74	9.70	Monthly Sampling
25-Mar-90	54.57	5273.22	0.48	Monthly and Quarterly
24-Apr-90	54.41	5273.38	0.16	Monthly Sampling
22-May-90	62.40	5265.39	-7.99	Monthly Sampling
27-Jun-90	61.10	5266.69	1.30	Monthly and Quarterly
[illegible]-Jul-90	63.21	5264.58	-2.11	Monthly Sampling
27-Aug-90	64.30	5263.49	-1.09	Monthly Sampling
28-Sep-90	64.36	5263.43	-0.06	Monthly and Quarterly
23-Oct-90	64.72	5263.07	-0.36	Monthly Sampling
19-Nov-90	64.88	5262.91	-0.16	Monthly Sampling
27-Dec-90	64.80	5262.99	0.08	Monthly and Quarterly

T/f

REPORT DATE: September 8, 1992

CLIENT: O.T. MINING

DATE SAMPLED: 08/26/92

DATE RECEIVED: 08/28/92

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Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity (μmhos/cm at 25°C)
Well #1	WF004	6.15	189	264
Well #2	WF005	8.49	339	602
Well #3	WF006	6.61	162	270

Review

REPORT DATE: November 11, 1992

CLIENT: O.T. Mining

DATE SAMPLED: 10-27-92

DATE RECEIVED: 10-28-92

FIELD ID	MSE, INC. LAB NO.	pH (SU)	TDS (mg/L)	CONDUCTIVITY (µmhos/cm @25° C)
Well #1	WF982	8.48	308	505
Well #2	WF983	8.74	356	552
Well #3	WF984	6.73	173	244

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NOV 17 1992
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Review

REPORT DATE: November 18, 1992

CLIENT: O.T. Mining

DATE SAMPLED: 09-29-92

DATE RECEIVED: 09-30-92

FIELD ID	MSE, INC. LAB NO.	pH (SU)	TDS (mg/L)	CONDUCTIVITY (μmhos/cm @25° C)	Diss. Cd (mg/L)	Diss. Cu (mg/L)	Diss. Zn (mg/L)
Well #1	WF474	6.85	135	254	0.0002	<0.003	0.043
Well #2	WF475	8.75	318	576	<0.0001	0.003	<0.012
Well #3	WF476	6.80	120	249	0.003	0.052	0.131

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NOV 23 1992
MONT. DEPT. OF HEALTH & ENV. SCIENCES
WATER QUALITY BUREAU

BFW
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REPORT DATE: December 9, 1992

CLIENT: O.T. Mining

Date Sampled: 11-18-92

Date Received: 11-20-92

FIELD ID	MSE, INC. LAB NO.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm @ 25°C
Well #1	WG334	6.63	199	251
Well #2	WG335	8.42	362	568
Well #3	WG336	6.92	171	242

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WATER QUALITY BUREAU

Review

January 21, 1993

CLIENT: O.T. Mining

DATE SAMPLED: 12-19-92

DATE RECEIVED: 12-24-92

FIELD	MSE, INC. LAB NO.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm@25°C	results in mg/L		
					Diss. Cd	Diss. Cu	Diss. Zn
Well #1	WG709	6.27	180	229	<0.0001	0.006	0.028
Well #2	WG710	8.42	356	522	<0.0001	0.024	<0.006
Well #3	WG711	6.88	199	227	0.0003	0.006	0.120

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JAN 26 1993
MONT. DEPT. OF HEALTH & ENV. SCIENCES
WATER QUALITY BUREAU

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File

August 16, 1993

CLIENT: O.T. Mining

DATE SAMPLED: 07-31-93

DATE RECEIVED: 08-02-93

FIELD	MSE, INC. LAB NO.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm@25° C
Well #1	WL019	6.41	131	268
Well #2	WL020	8.39	283	564
Well #3	WL021	6.27	173	277

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AUG 24 1993
MONT. DEPT. OF HEALTH & ENV. SCIENCES
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Review

July 20, 1993

CLIENT: O.T. Mining

DATE SAMPLED: 06-29-93

DATE RECEIVED: 07-01-93

FIELD	MSE, INC. LAB NO.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm@25°C	results in mg/L		
					Diss. Cd	Diss. Cu	Diss. Zn
Well #1	WK434	6.15	192	269	0.0008	0.025	0.037
Well #2	WK435	8.35	320	543	0.0003	0.002	<0.006
Well #3	WK436	6.04	205	286	0.0011	0.007	0.115

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Review

MINING CORPORATION

ubject: Tailing Pond Monitor Wells
ocation: Basin Mill - Basin, Montana

WELL NO. 2 (Collar Elevation = 5324.16 Feet Above Sea Level)

Date Monitored	Static Water Level From Collar	Water Level Elevation	Water Level Change From Previous Month	Remarks
19-Dec-89	55.38	5268.78	-----	Monthly and Quarterly Sampling
04-Jan-90	56.35	5267.81	-0.97	Monthly Sampling
22-Feb-90	57.20	5266.96	-0.85	Monthly Sampling
25-Mar-90	55.45	5268.71	1.75	Monthly and Quarterly Sampling
24-Apr-90	55.37	5268.79	0.08	Monthly Sampling
22-May-90	55.27	5268.89	0.10	Monthly Sampling
27-Jun-90	54.13	5270.03	1.14	Monthly and Quarterly Sampling
24-Jul-90	55.02	5269.14	-0.89	Monthly Sampling
27-Aug-90	56.10	5268.06	-1.08	Monthly Sampling
28-Sep-90	56.36	5267.80	-0.26	Monthly and Quarterly Sampling
23-Oct-90	57.46	5266.70	-1.10	Monthly Sampling
19-Nov-90	57.48	5266.68	-0.02	Monthly Sampling
27-Dec-90	57.38	5266.78	0.10	Monthly and Quarterly Sampling
21-Jan-91	56.66	5267.50	0.72	Monthly Sampling
23-Feb-91	56.69	5267.47	-0.03	Monthly Sampling
28-Mar-91	57.48	5266.68	-0.79	Monthly and Quarterly Sampling
26-Apr-91	57.28	5266.88	0.20	Monthly Sampling
23-May-91	55.73	5268.43	1.55	Monthly Sampling
26-Jun-91	54.04	5270.12	1.69	Monthly and Quarterly Sampling
26-Jul-91	55.80	5268.36	-1.76	Monthly Sampling
27-Aug-91	56.25	5267.91	-0.45	Monthly Sampling
24-Sep-91	55.19	5268.97	1.06	Monthly and Quarterly Sampling
23-Oct-91	56.26	5267.90	-1.07	Monthly Sampling
22-Nov-91	56.23	5267.93	0.03	Monthly Sampling
18-Dec-91	55.97	5268.19	0.26	Monthly and Quarterly Sampling

OVER

27-Jan-92	56.27	5267.89	-0.30	Monthly Sampling
26-Feb-92	56.62	5267.54	-0.35	Monthly Sampling
25-Mar-92	55.37	5268.79	1.25	Monthly and Quarterly Sampling
27-Apr-92	55.25	5268.91	0.12	Monthly Sampling
28-May-92	55.43	5268.73	-0.18	Monthly Sampling
29-Jun-92	55.65	5268.51	-0.22	Monthly and Quarterly Sampling
29-Jul-92	55.62	5268.54	0.03	Monthly Sampling
26-Aug-92	56.77	5267.39	-1.15	Monthly Sampling
26-Sep-92	58.03	5266.13	-1.26	Monthly and Quarterly Sampling
28-Oct-92	59.21	5264.95	-1.18	Monthly Sampling
18-Nov-92	57.38	5266.78	1.83	Monthly Sampling
21-Dec-92	57.09	5267.07	0.29	Monthly and Quarterly Sampling
27-Jan-93	56.61	5267.55	0.48	Monthly Sampling

MINING CORPORATION

Subject: Tailing Pond Monitor Wells
Location: Basin Mill - Basin, Montana

WELL NO. 2 (Collar Elevation = 5324.16 Feet Above Sea Level)

Date Monitored	Static Water Level From Collar	Water Level Elevation	Water Level Change From Previous Month	Remarks
19-Dec-89	55.38	5268.78	-----	Monthly and Quarterly Sampling
04-Jan-90	56.35	5267.81	-0.97	Monthly Sampling
22-Feb-90	57.20	5266.96	-0.85	Monthly Sampling
25-Mar-90	55.45	5268.71	1.75	Monthly and Quarterly Sampling
24-Apr-90	55.37	5268.79	0.08	Monthly Sampling
22-May-90	55.27	5268.89	0.10	Monthly Sampling
27-Jun-90	54.13	5270.03	1.14	Monthly and Quarterly Sampling
24-Jul-90	55.02	5269.14	-0.89	Monthly Sampling
27-Aug-90	56.10	5268.06	-1.08	Monthly Sampling
28-Sep-90	56.36	5267.80	-0.26	Monthly and Quarterly Sampling
23-Oct-90	57.46	5266.70	-1.10	Monthly Sampling
19-Nov-90	57.48	5266.68	-0.02	Monthly Sampling
27-Dec-90	57.38	5266.78	0.10	Monthly and Quarterly Sampling
21-Jan-91	56.66	5267.50	0.72	Monthly Sampling
23-Feb-91	56.69	5267.47	-0.03	Monthly Sampling
28-Mar-91	57.48	5266.68	-0.79	Monthly and Quarterly Sampling
26-Apr-91	57.28	5266.88	0.20	Monthly Sampling
23-May-91	55.73	5268.43	1.55	Monthly Sampling
26-Jun-91	54.04	5270.12	1.69	Monthly and Quarterly Sampling
26-Jul-91	55.80	5268.36	-1.76	Monthly Sampling
27-Aug-91	56.25	5267.91	-0.45	Monthly Sampling
24-Sep-91	55.19	5268.97	1.06	Monthly and Quarterly Sampling
23-Oct-91	56.26	5267.90	-1.07	Monthly Sampling
22-Nov-91	56.23	5267.93	0.03	Monthly Sampling
18-Dec-91	55.97	5268.19	0.26	Monthly and Quarterly Sampling

27-Jan-92	63.67	5264.12	-0.83	Monthly Sampling
26-Feb-92	63.74	5264.05	-0.07	Monthly Sampling
25-Mar-92	62.24	5265.55	1.50	Monthly and Quarterly Sampling
27-Apr-92	62.02	5265.77	0.22	Monthly Sampling
28-May-92	62.03	5265.76	-0.01	Monthly Sampling
29-Jun-92	62.41	5265.38	-0.38	Monthly and Quarterly Sampling
29-Jul-92	62.94	5264.85	-0.53	Monthly Sampling
26-Aug-92	64.18	5263.61	-1.24	Monthly Sampling
26-Sep-92	63.78	5264.01	0.40	Monthly and Quarterly Sampling
28-Oct-92	64.47	5263.32	-0.69	Monthly Sampling
18-Nov-92	63.78	5264.01	0.69	Monthly Sampling
21-Dec-92	64.52	5263.27	-0.74	Monthly and Quarterly Sampling
27-Jan-93	64.02	5263.77	0.50	Monthly Sampling

O.T. MINING CORPORATION

Subject: Tailing Pond Monitor Wells
Location: Basin Mill - Basin, Montana

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WATER QUALITY BUREAU

W E L L N O. 1 (Collar Elevation = 5327.79 Feet Above Sea Level)

Date Monitored	Static Water Level From Collar	Water Level Elevation	Water Level Change From Previous Month	Remarks
19-Dec-89	63.48	5264.31	-----	Monthly and Quarterly Sampling
04-Jan-90	64.75	5263.04	-1.27	Monthly Sampling
22-Feb-90	55.05	5272.74	9.70	Monthly Sampling
25-Mar-90	54.57	5273.22	0.48	Monthly and Quarterly Sampling
24-Apr-90	54.41	5273.38	0.16	Monthly Sampling
22-May-90	62.40	5265.39	-7.99	Monthly Sampling
27-Jun-90	61.10	5266.69	1.30	Monthly and Quarterly Sampling
24-Jul-90	63.21	5264.58	-2.11	Monthly Sampling
27-Aug-90	64.30	5263.49	-1.09	Monthly Sampling
28-Sep-90	64.36	5263.43	-0.06	Monthly and Quarterly Sampling
23-Oct-90	64.72	5263.07	-0.36	Monthly Sampling
19-Nov-90	64.88	5262.91	-0.16	Monthly Sampling
27-Dec-90	64.80	5262.99	0.08	Monthly and Quarterly Sampling
21-Jan-91	63.75	5264.04	1.05	Monthly Sampling
23-Feb-91	64.11	5263.68	-0.36	Monthly Sampling
28-Mar-91	65.09	5262.70	-0.98	Monthly and Quarterly Sampling
26-Apr-91	63.11	5264.68	1.98	Monthly Sampling
23-May-91	62.28	5265.51	0.83	Monthly Sampling
26-Jun-91	60.13	5267.66	2.15	Monthly and Quarterly Sampling
26-Jul-91	62.25	5265.54	-2.12	Monthly Sampling
27-Aug-91	64.00	5263.79	-1.75	Monthly Sampling
24-Sep-91	62.25	5265.54	1.75	Monthly and Quarterly Sampling
23-Oct-91	63.21	5264.58	-0.96	Monthly Sampling
22-Nov-91	63.13	5264.66	0.08	Monthly Sampling
18-Dec-91	62.79	5265.00	0.34	Monthly and Quarterly Sampling

OVER

REPORT DATE: January 29, 1991

CLIENT: O.T. Mining

1991 Data

DATE SAMPLED: 01/21/91

DATE RECEIVED: 01/22/91

Field ID	MSE,Inc. Lab No.	pH (SU)	TDS (mg/L)	SC µmhos/cm @ 25^{0}C
Well#1	W9503	6.51	258	176
Well#2	W9504	8.76	542	334
Well#3	W9505	6.48	251	177

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FEB 13 1991
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WATER QUALITY BUREAU

REPORT DATE: February 5, 1991

CLIENT: O.T. Mining

DATE SAMPLED: 12/27/90

DATE RECEIVED: 12/28/90

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm @ 25°C	Dissolved (mg/L)		
					Cd	Cu	Zn
Well#1	W9416	6.50	197	283	<0.004	0.008	0.04
Well#2	W9417	8.42	373	589	0.011	0.033	0.02
Well#3	W9418	6.34	197	274	0.005	<0.001	0.13

RECEIVED
FEB 11 1991
MONT. DEPT. OF HEALTH & ENV. SCIENCES
WATER QUALITY BUREAU

REPORT DATE: March 6, 1991

CLIENT: O.T. MINING

DATE SAMPLED: 02/22/91

DATE RECEIVED: 02/25/91

Comment: Samples had exceeded the holding time for pH and TDS when received by the laboratory

Field ID	MSE, Inc. Lab No.	pH (SU)	Conductivity µmhos/cm @ 25 °C	TDS (mg/L)
Well #1	W9659	6.70	274	298
Well #2	W9660	8.88	587	503
Well #3	W9661	6.75	269	332

REPORT DATE: April 22, 1991

CLIENT: O.T. MINING

DATE SAMPLED: 03/28/91

DATE RECEIVED: 04/01/91

					Dissolved (results in mg/L)		
Field ID	MSE, Inc. Lab No.	pH (SU)	TDS mg/L	SC µmhos/cm @ 25 °C	Cd	Cu	Zn
Well #1	W9913	6.69	221	269	0.0002	0.014	0.030
Well #2	W9914	8.80	432	581	<0.0001	0.003	0.027
Well #3	W9915	6.55	214	267	0.0003	0.012	0.165

REPORT DATE: May 3, 1991

CLIENT: O.T. MINING

DATE SAMPLED: 04/26/91

DATE RECEIVED: 05/01/91

Field ID	MSE, Inc. Lab No.	pH (SU)	Conductivity µmhos/cm @ 25 °C	TDS (mg/L)
Well #1	WA041	6.82	279	178
Well #2	WA042	6.75	276	203
Well #3	WA043	6.64	276	205

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MAY 0 9 1991
[illegible] DEPT. OF HEALTH & E[illegible] SCIENCES
[illegible] QUALITY BU[illegible]

REPORT DATE: August 13, 1991

CLIENT: O.T. MINING

DATE SAMPLED: 07/26/91

DATE RECEIVED: 08/01/91

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm @ 25 °C
Well #1	WA842	6.70	228	262
Well #2	WA843	8.68	384	573
Well #3	WA844	7.13	232	304

REPORT DATE: September 9, 1991

CLIENT: O.T. MINING

DATE SAMPLED: 08/27/91

DATE RECEIVED: 08/29/91

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm @ 25 °C
Well #1	WB067	6.47	155	259
Well #2	WB068	8.44	335	573
Well #3	WB069	6.35	162	252

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REPORT DATE: October 23, 1991

CLIENT: O. T. Mining

DATE SAMPLED: 09/24/91

DATE RECEIVED: 09/25/91

	MSE, Inc.			SC µmhos/cm			
Field ID	Lab No.	pH(SU)	TDS(mg/L)	@ 25 °C	Diss Cd	Diss Cu	Diss Zn
Well #1	WB364	6.51	54	255	<0.002	<0.006	0.039
Well #2	WB365	8.53	234	572	<0.002	<0.006	<0.002
Well #3	WB366	6.61	164	248	<0.002	<0.006	0.132

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NOV 04 1991
[illegible] SCIENCES
[illegible]

REPORT DATE: November 6, 1991

CLIENT: **O.T. MINING**

DATE SAMPLED: 10/23/91

DATE RECEIVED: 10/25/91

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm @ 25 °C
Well #1	WB632	6.39	182	262
Well #2	WB633	8.57	342	578
Well #3	WB634	6.88	176	258

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NOV 12 1991
MONT. DEPT. OF HEALTH & ENV. SCIENCES
WATER QUALITY BUREAU

Anion Review

REPORT DATE: December 4, 1991

CLIENT: O.T. MINING

DATE RECEIVED: 11/26/91

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	Conductivity µmhos/cm @ 25 °C
Well #1	WB941	6.57	163	262
Well #2	WB942	8.47	343	564
Well #3	WB943	7.66	307	470

RECEIVED
DEC 16 1991
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WATER QUALITY BUREAU

Anion Review

REPORT DATE: January 18, 1990

CLIENT: O. T. MINING -BASIN MILL

DATE RECEIVED: December 28, 1989.

FIELD ID	MSE,INC. LAB NO.	pH (SU)	TDS (mg/L)	SC umhos/cm @25°C	DISSOLVED METALS (mg/L) Cd	Cu	Zn
Well#1	W6920	6.53	153	259	0.0003	0.01	0.14
Well#2	W6921	8.59	354	525	0.0004	<0.01	0.01
Well#3	W6922	6.66	207	294	0.0002	<0.01	0.03

REPORT DATE: January 24, 1990

CLIENT: O. T. MINING

DATE SAMPLED: 1-14-90

DATE RECEIVED: 1-15-90

FIELD ID	MSE,INC. LAB NO.	pH(SU)	TDS (mg/L)	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)
WELL #1	W7024	6.42	272	3110
WELL #2	W7025	8.48	338	574
WELL #3	w7026	6.29	327	285

Why is well # 2 pH so high? I seem to remember all 3 wells are completed in different formations. Is #2 upgradient?

REPORT DATE: March 7, 1990

CLIENT: O. T. MINING

DATE RECEIVED: 2-26-90

FIELD ID	MSE, INC. LAB NO.	pH(SU)	TDS (mg/L)	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)
WELL #1	W7286	6.56	181	265
WELL #2	W7287	8.68	345	542
WELL #3	W7288	6.36	3180	251

REPORT DATE: APRIL 17, 1990

SWL
info?

8/15/90 He said he would check as to why no SWL info was submitted in Mar, Apr, May, June [illegible] or July [illegible]

Paul Smith
225-3703

10/30/89 [illegible]
12/89

CLIENT: O. T. MINING -BASIN MILL

DATE SAMPLED: 3-25-90

DATE RECEIVED: 3-26-90

FIELD ID	MSE, INC. LAB NO.	pH (SU)	TDS (mg/L)	SC umhos/cm @25°C	TOTAL METALS (mg/L) Cd	Cu	Zn
Well#1	W7435	6.39	156	270	<0.0001	<0.008	0.038
Well#2	W7436	8.29	329	542	<0.0001	<0.008	0.008
Well#3	W7437	6.31	122	259	0.0002	<0.008	0.119

REPORT DATE: MAY 2, 1990

CLIENT: O.T. MINING

DATE SAMPLED: 4-23-90

DATE RECEIVED: 4-24-90

FIELD ID	MSE, Inc. LAB #	pH(SU)	TDS (mg/L)	SC umhos/cm @ 25°C
Well #1	W7570	6.78	308	281
Well #2	W7571	8.86	496	560
Well #3	W7572	6.71	327	260

RECEIVED
MAY 9 - 1990

REPORT DATE: May 30, 1990

CLIENT: O. T. MINING

DATE SAMPLED: 5-22-90

DATE RECEIVED: 5-22-90

FIELD ID.	MSE, INC. LAB NO.	pH (SU)	TDS(mg/L)	SC umhos/cm @ 25°C	c (SC x c = TDS)
Well #1	W7720	7.04	1580	294	5.37
Well #2	W7721	8.83	154	578	0.26
Well #3	W7722	6.82	186	274	0.68

10/23/90 – Kevin Kissell – MSE

- analysis OK.

★ weighing error possible or external contamination

- QA/QC "came out"

- no explanation known for high TDS other than contamin

REPORT DATE: AUGUST 10, 1990

CLIENT: O.T. MINING

DATE SAMPLED: 07-24-90

DATE RECEIVED: 07-26-90

FIELD ID	MSE,Inc. LAB NO.	pH (SU)	TDS (mg/L)	SC umhos/cm @ $25^{\circ}C$
Well#1	W8076	6.41	398.0	283
Well#2	W8077	8.21	636.0	611
Well#3	W8078	6.40	464.0	274

REPORT DATE: August 10, 1990

CLIENT: O. T. MINING

DATE SAMPLED: 07-02-90

DATE RECEIVED: 07-02-90

FIELD ID.	MSE, Inc. LAB NO.	pH (SU)	TDS (mg/L)	SC umhos/cm @ 25°C	Dissolved Metals (mg/L)		
					Cd	Cu	Zn
Well #1	W7908	6.49	267	293	0.0003	0.002	<0.012
Well #2	W7909	8.03	375	579	0.0002	0.002	<0.012
Well #3	W7910	6.44	203	278	0.0004	0.008	0.042

WL?

REPORT DATE: September 10, 1990

CLIENT: O. T. MINING

DATE SAMPLED: 8-27-90

DATE RECEIVED: 8-29-90

(sc × e = TD

FIELD ID	MSE, INC. LAB NO.	pH(SU)	TDS (mg/L)	SPECIFIC CONDUCTANCE (umhos/cm @ 25°C)	e
WELL #1	W8407	7.31	287	252	1.14
WELL #2	W8408	8.67	456	546	0.84
WELL #3	W8409	7.27	273	243	1.12

REPORT DATE: October 30, 1990

CLIENT: O. T. Mining

DATE SAMPLED: 09/28/90

DATE RECEIVED: 10/01/90

	MSE, Inc.	pH	TDS	SC µmhos/cm	Results in (mg/L)		
Field ID	Lab No.	(SU)	(mg/L)	@ 25°C	Cd	Cu	Zn
Well #1	W8666	6.53	293	263	0.0002	<0.017	0.04
Well #2	W8667	8.70	444	568	0.0009	<0.017	<0.01
Well #3	W8668	6.53	210	264	<0.0001	<0.017	0.13

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REPORT DATE: November 9, 1990

CLIENT: O.T. Mining

DATE SAMPLED: 10/23/90

DATE RECEIVED: 10/25/90

Field ID	MSE, Inc. Lab No.	pH (SU)	TDS (mg/L)	SC µmhos/cm @ 25°C
Well#1	W8912	6.53	240.0	250
Well#2	W8913	8.72	427.0	524
Well#3	W8914	6.58	271.0	241

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NOV 20 1990
MONTANA DEPT. OF HEALTH & ENV. SCIENCES
WATER QUALITY BUREAU

REPORT DATE: November 29, 1990

CLIENT: O.T. Mining

DATE SAMPLED: 11/19/90

DATE RECEIVED: 11/20/90

Field ID	MSE,Inc. Lab No.	pH (SU)	TDS (mg/L)	SC µmhos/cm @ 25°C
Well#1	W9124	6.30	232	249
Well#2	W9125	8.46	434	503
Well#3	W9126	6.27	256	247

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P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
800-873-5227

LABORATORY REPORT

TO: Gulf Titanium, LTD
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-16885
DATE: 10/23/89 dya

WATER ANALYSIS

Basin Mill
Well #3
Sampled 09/29/89 @ 12:00
Submitted 10/03/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	0.001
Zinc	0.15

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LABORATORY REPORT

TO: Gulf Titanium, LTD
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-16884
DATE: 10/23/89 dya

WATER ANALYSIS

Basin Mill
Well #2
Sampled 09/29/89 @ 11:30
Submitted 10/03/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.08

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LABORATORY REPORT

TO: Gulf Titanium, LTD
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-16883
DATE: 10/23/89 dya

WATER ANALYSIS

Basin Mill
Tails
Sampled 09/29/89 @ 12:30
Submitted 10/03/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.01

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800-873-5227

LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-16011 spi
DATE: 10/03/89 dya

QUALITY ASSURANCE - SPIKED ANALYSIS

Basin Mill
Tails
Sampled 09/15/89 @ 1:30 p.m.
Submitted 09/19/89

Dissolved:	% Recovery
Arsenic	108
Cadmium	95
Zinc	100

ENERGY LABORATORIES

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800-873-5227

LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-16011
DATE: 10/03/89 dya

WATER ANALYSIS

Basin Mill
Tails
Sampled 09/15/89 @ 1:30 p.m.
Submitted 09/19/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	<0.01

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.

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800-873-5227

LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-16013
DATE: 10/03/89 dya

WATER ANALYSIS

Basin Mill
Well #3
Sampled 09/15/89 @ 1:00 p.m.
Submitted 09/19/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.14

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-16012
DATE: 10/03/89 dya

WATER ANALYSIS

Basin Mill
Well #2
Sampled 09/15/89 @ 12:30 p.m.
Submitted 09/19/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.07

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-14400 -05
DATE: 10/03/89 dya

WATER ANALYSIS
Basin Mill
Submitted 09/12/89

Lab No.	Identification	Arsenic (mg/l)	Cadmium (mg/l)	Zinc (mg/l)
89-14400	Tails, Sampled 08/31/89 @ 1300	<0.005	<0.001	<0.01
89-14401	Tails, Sampled 09/08/89 @ 1330	<0.005	<0.001	0.03
89-14402	Well #2, Sampled 08/30/89 @ 1130	<0.005	0.002	0.13
89-14403	Well #2, Sampled 09/08/89 @ 1200	<0.005	0.002	0.07
89-14404	Well #3, Sampled 08/31/89 @ 1115	<0.005	<0.001	0.07
89-14405	Well #3, Sampled 09/08/89 @ 1245	<0.005	<0.001	0.12

Quality Assurance Data

Lab No.	Identification	Arsenic	Cadmium	Zinc
89-14400	Duplicate Analysis	<0.005	<0.001	<0.01
89-14401	Spiked Analysis	117 % Rec.	97 % Rec.	106 % Rec.

ENERGY LABORATORIES

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800-873-5227

LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-13731 -41
DATE: 09/12/89 dya

Quality Assurance Data
Basin Mill
Submitted 08/30/89

Lab No.	Identification	Arsenic (mg/l)	Cadmium (mg/l)	Zinc (mg/l)
89-13731	Spiked Analysis	104 % Rec.	98 % Rec.	107 % Rec.
89-13740	Duplicate Analysis	0.005	<0.001	0.01
89-13741	Spiked Analysis	97 % Rec.	104 % Rec.	109 % Rec.

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800-873-5227

LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-13731 -41
DATE: 09/12/89 dya

WATER ANALYSIS
Basin Mill
Submitted 08/30/89

Lab No.	Identification	Arsenic (mg/l)	Cadmium (mg/l)	Zinc (mg/l)
89-13731	Basin-Well #2, Sampled 07/28/89 @ 1200	<0.005	0.001	0.05
89-13732	Basin-Well #2, Sampled 08/04/89 @ 1200	<0.005	<0.001	0.06
89-13733	Basin-Well #2, Sampled 08/11/89 @ 1230	<0.005	0.001	0.06
89-13734	Basin-Well #2, Sampled 08/18/89 @ 1235	<0.005	<0.001	0.06
89-13735	Basin-Well #3, Sampled 07/28/89 @ 1215	<0.005	<0.001	0.13
89-13736	Basin-Well #3, Sampled 08/04/89 @ 1230	<0.005	<0.001	0.13
89-13737	Basin-Well #3, Sampled 08/11/89 @ 1245	<0.005	<0.001	0.13
89-13738	Basin-Well #3, Sampled 08/18/89 @ 1305	<0.005	<0.001	0.14
89-13739	Basin-Tails, Sampled 07/28/89 @ 12:30	0.005	<0.001	<0.01
89-13740	Basin-Tails, Sampled 08/11/89 @ 1300	0.005	<0.001	0.01
89-13741	Basin-Tails, Sampled 08/18/89 @ 1300	0.006	<0.001	0.01

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LABORATORY REPORT

TO: Gulf Titanium, LTD
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-11155
DATE: 08/07/89 dya

WATER ANALYSIS

Basin Mill
Well #3
Sampled 07/21/89 @ 1200
Submitted 07/25/89

Dissolved	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.13

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LABORATORY REPORT

TO: Gulf Titanium, LTD
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-11154
DATE: 08/07/89 dya

WATER ANALYSIS

Basin Mill
Well #2
Sampled 07/21/89 @ 1215
Submitted 07/25/89

Dissolved	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.05

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-10789
DATE: 07/21/89 dya

WATER ANALYSIS

Basin Mill
Tails
Sampled 07/13/89 @ 0900
Submitted 07/18/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	<0.01

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-10788
DATE: 07/21/89 dya

WATER ANALYSIS

Basin Mill
Well #3
Sampled 07/13/89 @ 0835
Submitted 07/18/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.14

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-10787
DATE: 07/21/89 dya

WATER ANALYSIS

Basin Mill
Well #2
Sampled 07/13/89 @ 0850
Submitted 07/18/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.05

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-10530 dup
DATE: 07/20/89 dya

QUALITY ASSURANCE - DUPLICATE ANALYSIS

Basin Mill
Well #3
Sampled 07/06/89 @ 1000
Submitted 07/12/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.13

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LABORATORIES

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800-873-5227

LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-10530
DATE: 07/20/89 dya

WATER ANALYSIS

Basin Mill
Well #3
Sampled 07/06/89 @ 1000
Submitted 07/12/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	<0.001
Zinc	0.13

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-10529
DATE: 07/20/89 dya

WATER ANALYSIS

Basin Mill
Well #2
Sampled 07/06/89 @ 1000
Submitted 07/12/89

Dissolved:	mg/l
Arsenic	<0.005
Cadmium	0.001
Zinc	0.04

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-10205 -210
DATE: 07/07/89 dya

WATER ANALYSIS

Submitted 07/03/89

Lab No.	Identification	Cadmium (mg/l)	Copper (mg/l)	Zinc (mg/l)
89-10205	Basin Mill-Tails, Sampled 06/22/89 @ 0900	<0.001	<0.01	0.01
89-10206	Basin Mill-Tails, Sampled 06/29/89 @ 1000	<0.001	<0.01	0.01
89-10207	Basin Mill-Well #2 Sampled 06/22/89 @ 0900	<0.001	0.03	0.17
89-10208	Basin Mill-Well #2 Sampled 06/29/89 @ 0930	<0.001	<0.01	0.04
89-10209	Basin Mill-Well #3 Sampled 06/22/89 @ 0900	<0.001	<0.01	0.05
89-10210	Basin Mill-Well #3 Sampled 06/29/89 @ 0900	<0.001	<0.01	0.13

Quality Assurance - Duplicate Analysis

Lab No.	Identification	Cadmium (mg/l)	Copper (mg/l)	Zinc (mg/l)
89-10210	Duplicate Analysis	<0.001	<0.01	0.14

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800-873-5227

LABORATORY REPORT

TO: Gult Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-9131
DATE: 06/[illegible]/89 dja

WATER ANALYSIS

Basin Mill
Tailings
Sampled 06/08/89
Submitted 06/14/89

Dissolved:	mg/l
Cadmium	0.003
Copper	<0.01
Zinc	<0.01

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800-873-5227

LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-9130 dup
DATE: 06/20/89 dya

QUALITY ASSURANCE - DUPLICATE ANALYSIS

Basin Mill
Well #3
Sampled 06/08/89
Submitted 06/14/89

Dissolved:	mg/l
Cadmium	0.006
Copper	<0.01
Zinc	0.16

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-9130
DATE: 06/20/89 dya

WATER ANALYSIS

Basin Mill
Well #3
Sampled 06/08/89
Submitted 06/14/89

Dissolved:	mg/l
Cadmium	0.005
Copper	<0.01
Zinc	0.13

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LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-9129
DATE: 06/20/89 dya

WATER ANALYSIS

Basin Mill
Well #2
Sampled 06/08/89
Submitted 06/14/89

Dissolved:	mg/l
Cadmium	0.003
Copper	<0.01
Zinc	0.04

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800-873-5227

LABORATORY REPORT

TO: Gulf Titanium
ADDRESS: P.O. Box 5358
Helena, MT 59604

LAB NO.: 89-9131 spi
DATE: 06/20/89 dya

QUALITY ASSURANCE - SPIKED ANALYSIS

Basin Mill
Tailings
Sampled 06/08/89
Submitted 06/14/89

Dissolved:	% Recovery
Cadmium	99
Copper	100
Zinc	105

Gulf
TITANIUM INC.
P.O. BOX 5358 • Helena, Montana 59604 • (406) 449-4817

August 2, 1989

Mr. John Arrigo
Department of Health and Sciences
Water Quality Bureau
Capitol Station
Helena, MT 59620

Dear Mr. Arrigo:

Attached is a summary of laboratory analyses for the monitor well system at the Basin Mill complex near Basin, Montana. Groundwater samples have been collected and analyzed weekly for the period of 6-8-89 through 7-13-89 encompassing 6 weeks of record.

Based on the laboratory results, no significant changes in groundwater quality have occurred as a result of start-up of the mill and tailings disposal facility. Gulf Titanium proposes to modify the frequency of groundwater sampling from weekly sample collection to monthly.

For your information, we have provided an estimate of the time involved for seepage from the tailings impoundment to the foundation materials underneath the impoundment. The calculation assumes that previous tailings deposited in the impoundment controls the seepage loss resulting from the deposition of new tailings in the impoundment.

Please let us know if you require further information. Gulf Titanium anticipates that monthly sampling will begin as soon as notification is received from the Water Quality Bureau.

Sincerely,

Martin Sadd
etc.

GROUNDWATER QUALITY SUMMARY
BASIN MILL COMPLEX

1.0 SUMMARY

Gulf-Titanium, Ltd., in compliance with the Montana Groundwater Pollution Control System permit issued by the Water Quality Bureau, has conducted weekly sampling of tailings effluent and groundwater at the Basin Mill Complex since June 8, 1989. Laboratory analysis to date has indicated that no measurable change or trends are identified (Table 1).

TABLE 1
LABORATORY ANALYSES - BASIN MILL COMPLEX

	Arsenic	Cadmium	Copper	Zinc	Date
Well #1	-	-	-	-	6/8/89
Well #2	-	0.003	<0.01	0.04	
Well #3	-	0.005	<0.01	0.13	
Tailings	-	0.003	<0.01	<0.01	
Well #1	-	-	-	-	6/22/89
Well #2	-	<0.001	0.03	0.17	
Well #3	-	<0.001	<0.01	0.05	
Tailings	-	<0.001	<0.01	0.01	
Well #1	-	-	-	-	6/29/89
Well #2	-	<0.001	<0.01	0.04	
Well #3	-	<0.001	<0.01	0.13	
Tailings	-	<0.001	<0.01	0.01	
Well #1	-	-	-	-	7/6/89
Well #2	<0.005	0.001	-	0.04	
Well #3	<0.005	<0.001	-	0.13	
Tailings	<0.005	<0.001	-	0.13	
Well #1	-	-	-	-	7/13/89
Well #2	<0.005	<0.001	-	0.05	
Well #3	<0.005	<0.001	-	0.14	
Tailings	<0.005	<0.001	-	<0.01	

SELF MONITORING

This is the water sample from the Basin Mill at Basin, Montana, owned by the O.T. Mining Corp. of Montreal, Quebec. Canada.

W.M. Johns
2302 Banks
Butte, Mt.
782-0523

EMS/ABM LABS
RESEARCH CENTER, S. PARKMONT
(406) 494-5119
P.O. BOX 3481
BUTTE, MONTANA
59702

CLIENT OT Mining Company
DATE 08-22-88
SAMPLE LOCATION Well # 1, First Sample
SAMPLE DATE 08-25-88

LAB # A-379
ANALYST RM
Lease # W NA

LABORATORY ANALYSIS

pH, s.u.	6.98
Conductivity, uohms/cm @ 25 C	180.00
Alkalinity as CaC03, mg/l	77.00
Hardness as CaC03, mg/l	40.00
Total Dissolved Solids, mg/l	134.80
Total Suspended Solids, mg/l	8.00

Calcium as Ca, mg/l	22.00	meq/l	1.10
Sodium, mg/l	7.00	meq/l	0.30
Magnesium, mg/l	4.40	meq/l	0.36
Potassium, mg/l	0.70	meq/l	0.02
Bicarbonate, mg/l	89.00	meq/l	1.46
Carbonate, mg/l	0.00	meq/l	0.00
Chloride, mg/l	8.70	meq/l	0.25
Sulfate, mg/l	3.00	meq/l	0.06
Total anions			1.77 meq/l
Total cations			1.78 meq/l
Ionic balance			(0.44) %

Trace Metals, Dissolved mg/l.

Aluminum	< 0.02	Arsenic	< 0.002
Barium	< 0.50	Lead	< 0.02
Cadmium	< 0.02	Manganese	0.17
Chromium	< 0.05	Mercury	< 0.005
Copper	< 0.02	Selenium	< 0.005
Iron	0.65	Zinc	0.09
SAR	0.35	Oil and Grease	NA

Comments:
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Approved by

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BUTTE, MONTANA
59702

CLIENT	OT Mining Company	LAB #	A-381
DATE	08-22-88	ANALYST	RM
SAMPLE LOCATION	Well # 1,Second Sample	Lease # W	NA
SAMPLE DATE	08-25-88		

LABORATORY ANALYSIS

pH, s.u.	7.82
Conductivity, uohms/cm @ 25 C	200.00
Alkalinity as CaCO3, mg/l	87.00
Hardness as CaCO3, mg/l	38.00
Total Dissolved Solids, mg/l	156.00
Total Suspended Solids, mg/l	6.00

Calcium as Ca, mg/l	20.00	meq/l...	1.00	
Sodium, mg/l	14.00	meq/l...	0.61	
Magnesium, mg/l	4.40	meq/l...	0.36	
Potassium, mg/l	0.70	meq/l...	0.02	
Bicarbonate, mg/l	106.00	meq/l...	1.74	
Carbonate, mg/l	0.00	meq/l...	0.00	
Chloride, mg/l	8.00	meq/l...	0.23	
Sulfate, mg/l	3.00	meq/l...	0.06	
Total anions			2.03	meq/l
Total cations			1.99	meq/l
Ionic balance			0.96	%

Trace Metals, Dissolved mg/l.

Aluminum	< 0.02	Arsenic	< 0.002
Barium	< 0.50	Lead	< 0.02
Cadmium	< 0.02	Manganese	< 0.02
Chromium	< 0.05	Mercury	< 0.005
Copper	< 0.02	Selenium	< 0.005
Iron	0.74	Zinc	0.05
SAR	0.35	Oil and Grease	NA

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BUTTE, MONTANA
59702

CLIENT	OT Mining Company	LAB #	A-380
DATE	08-22-88	ANALYST	RM
SAMPLE LOCATION	Well # 2, First Sample	Lease #	W NA
SAMPLE DATE	08-25-88		

LABORATORY ANALYSIS

pH, s.u.	8.60
Conductivity, uohms/cm @ 25 C	550.00
Alkalinity as CaCO3, mg/l	213.00
Hardness as CaCO3, mg/l	20.00
Total Dissolved Solids, mg/l	434.00
Total Suspended Solids, mg/l	10.00

Calcium as Ca, mg/l	16.00	meq/l	0.80	
Sodium, mg/l	105.00	meq/l	4.57	
Magnesium, mg/l	1.00	meq/l	0.08	
Potassium, mg/l	0.80	meq/l	0.02	
Bicarbonate, mg/l	260.00	meq/l	4.26	
Carbonate, mg/l	16.00	meq/l	0.53	
Chloride, mg/l	35.00	meq/l	0.99	
Sulfate, mg/l	1.00	meq/l	0.02	
Total anions			5.80	meq/l
Total cations			5.47	meq/l
Ionic balance			2.96	%

Trace Metals, Dissolved mg/l.

Aluminum	< 0.02	Arsenic	< 0.002
Barium	< 0.50	Lead	< 0.02
Cadmium	< 0.02	Manganese	0.80
Chromium	< 0.05	Mercury	< 0.005
Copper	< 0.02	Selenium	0.005
Iron	1.70	Zinc	0.25
SAR	7.00	Oil and Grease	NA

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BUTTE, MONTANA
59702

CLIENT	OT Mining Company	LAB #	A-382
DATE	08-22-88	ANALYST	RM
SAMPLE LOCATION	Well # 2, Second Sample	Lease # W	NA
SAMPLE DATE	08-25-88		

LABORATORY ANALYSIS

pH, s.u.	8.72
Conductivity, uohms/cm @ 25 C	550.00
Alkalinity as CaC03, mg/l	220.00
Hardness as CaC03, mg/l	20.00
Total Dissolved Solids, mg/l	440.00
Total Suspended Solids, mg/l	5.00

Calcium as Ca, mg/l	16.00	meq/l	0.80	
Sodium, mg/l	107.00	meq/l	4.65	
Magnesium, mg/l	1.00	meq/l	0.08	
Potassium, mg/l	1.80	meq/l	0.05	
Bicarbonate, mg/l	262.00	meq/l	4.29	
Carbonate, mg/l	17.00	meq/l	0.57	
Chloride, mg/l	33.00	meq/l	0.93	
Sulfate, mg/l	2.00	meq/l	0.04	
Total anions			5.83	meq/l
Total cations			5.58	meq/l
Ionic balance			2.21	%

Trace Metals, Dissolved mg/l.

Aluminum	< 0.02	Arsenic	< 0.002
Barium	< 0.50	Lead	< 0.02
Cadmium	< 0.02	Manganese	0.45
Chromium	< 0.05	Mercury	< 0.005
Copper	< 0.02	Selenium	< 0.005
Iron	1.25	Zinc	0.80
SAR	7.00	Oil and Grease	NA

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SELF MONITORING

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BUTTE, MONTANA
59702

CLIENT	OT Mining Company	LAB #	A-389
DATE	09-27-88	ANALYST	RM
SAMPLE LOCATION	Well # 1	Lease # W	NA
SAMPLE DATE	09-19-88		

LABORATORY ANALYSIS

?

pH, s.u.	7.56
Conductivity, uohms/cm @ 25 C	190.00
Alkalinity as CaCO3, mg/l	79.00
Hardness as CaCO3, mg/l	39.00
Total Dissolved Solids, mg/l	140.00
Total Suspended Solids, mg/l	< 3.00

Calcium as Ca, mg/l	19.00	meq/l...	0.95	
Sodium, mg/l	11.00	meq/l...	0.48	
Magnesium, mg/l	4.00	meq/l...	0.33	
Potassium, mg/l	0.50	meq/l...	0.01	
Bicarbonate, mg/l	96.00	meq/l...	1.57	
Carbonate, mg/l	0.00	meq/l...	0.00	
Chloride, mg/l	8.00	meq/l...	0.23	
Sulfate, mg/l	2.00	meq/l...	0.04	
Total anions			1.84	meq/l
Total cations			1.77	meq/l
Ionic balance			2.00	%

Trace Metals, Dissolved mg/l.

Aluminum	< 0.02	Arsenic	< 0.002
Barium	< 0.50	Lead	< 0.02
Cadmium	< 0.02	Manganese	< 0.02
Chromium	< 0.05	Mercury	< 0.005
Copper	< 0.02	Selenium	< 0.005
Iron	0.60	Zinc	0.06
SAR	< 1.00	Oil and Grease	NA

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P.O. BOX 3481
BUTTE, MONTANA
59702

CLIENT	OT Mining Company	LAB #	A-390
DATE	09-27-88	ANALYST	RM
SAMPLE LOCATION	Well # 2	Lease # W	NA
SAMPLE DATE	09-19-88		

LABORATORY ANALYSIS

pH, s.u.	7.98
Conductivity, uohms/cm @ 25 C	520.00
Alkalinity as CaCO3, mg/l	199.00
Hardness as CaCO3, mg/l	19.00
Total Dissolved Solids, mg/l	390.00
Total Suspended Solids, mg/l	< 3.00

Calcium as Ca, mg/l	15.00	meq/l	0.75	
Sodium, mg/l	98.00	meq/l	4.26	
Magnesium, mg/l	1.00	meq/l	0.08	
Potassium, mg/l	1.00	meq/l	0.03	
Bicarbonate, mg/l	243.00	meq/l	3.98	
Carbonate, mg/l	0.00	meq/l	0.00	
Chloride, mg/l	30.00	meq/l	0.85	
Sulfate, mg/l	2.00	meq/l	0.04	
Total anions			4.87	meq/l
Total cations			5.12	meq/l
Ionic balance			(2.49)	%

Trace Metals, Dissolved mg/l.

Aluminum	< 0.02	Arsenic	< 0.002
Barium	< 0.50	Lead	< 0.02
Cadmium	< 0.02	Manganese	0.40
Chromium	< 0.05	Mercury	< 0.005
Copper	< 0.02	Selenium	< 0.005
Iron	0.77	Zinc	0.25
SAR	6.60	Oil and Grease	NA

Comments:

Two copies to Butte, Original and copy to Montreal.

Approved by

EMS/ABM LABS
RESEARCH CENTER, S. PARKMONT
(406) 494-5119
P.O. BOX 3481
BUTTE, MONTANA
59702

CLIENT	OT Mining Company	LAB #	A-389
DATE	09-27-88	ANALYST	RM
SAMPLE LOCATION	Well # 1	Lease # W	NA
SAMPLE DATE	09-19-88		

LABORATORY ANALYSIS

pH, s.u.	7.56
Conductivity, uohms/cm @ 25 C	190.00
Alkalinity as CaC03, mg/l	79.00
Hardness as CaC03, mg/l	39.00
Total Dissolved Solids, mg/l	140.00
Total Suspended Solids, mg/l	< 3.00

Calcium as Ca, mg/l	19.00	meq/l	0.95	
Sodium, mg/l	11.00	meq/l	0.48	
Magnesium, mg/l	4.00	meq/l	0.33	
Potassium, mg/l	0.50	meq/l	0.01	
Bicarbonate, mg/l	96.00	meq/l	1.57	
Carbonate, mg/l	0.00	meq/l	0.00	
Chloride, mg/l	8.00	meq/l	0.23	
Sulfate, mg/l	2.00	meq/l	0.04	
Total anions			1.84	meq/l
Total cations			1.77	meq/l
Ionic balance			2.00	%

Trace Metals, Dissolved mg/l.

Aluminum	< 0.02	Arsenic	< 0.002
Barium	< 0.50	Lead	< 0.02
Cadmium	< 0.02	Manganese	< 0.02
Chromium	< 0.05	Mercury	< 0.005
Copper	< 0.02	Selenium	< 0.005
Iron	0.60	Zinc	0.06
SAR	< 1.00	Oil and Grease	NA

Comments:
Two copies to Butte, Original and copy to Montreal.

Approved by

EMS/ABM LABS
RESEARCH CENTER, S. PARKMONT
(406) 494-5119
P.O. BOX 3481
BUTTE, MONTANA
59702

CLIENT	OT Mining Company	LAB #	A-390
DATE	09-27-88	ANALYST	RM
SAMPLE LOCATION	Well # 2	Lease # W	NA
SAMPLE DATE	09-19-88		

LABORATORY ANALYSIS

pH, s.u.	7.98
Conductivity, uohms/cm @ 25 C	520.00
Alkalinity as CaC03, mg/l	199.00
Hardness as CaC03, mg/l	19.00
Total Dissolved Solids, mg/l	390.00
Total Suspended Solids, mg/l	< 3.00

Calcium as Ca, mg/l	15.00	meq/l...	0.75	
Sodium, mg/l	98.00	meq/l...	4.26	
Magnesium, mg/l	1.00	meq/l...	0.08	
Potassium, mg/l	1.00	meq/l...	0.03	
Bicarbonate, mg/l	243.00	meq/l...	3.98	
Carbonate, mg/l	0.00	meq/l...	0.00	
Chloride, mg/l	30.00	meq/l...	0.85	
Sulfate, mg/l	2.00	meq/l...	0.04	
Total anions			4.87	meq/l
Total cations			5.12	meq/l
Ionic balance			(2.49)	%

Trace Metals, Dissolved mg/l.

Aluminum	< 0.02	Arsenic	< 0.002
Barium	< 0.50	Lead	< 0.02
Cadmium	< 0.02	Manganese	0.40
Chromium	< 0.05	Mercury	< 0.005
Copper	< 0.02	Selenium	< 0.005
Iron	0.77	Zinc	0.25
SAR	6.60	Oil and Grease	NA

Comments:
Two copies to Butte, Original and copy to Montreal.

Approved by

CLIENT: MEDALLION MINERALS

SAMPLE TYPE: WATER

DATE COLLECTED: 5-86

DATE RECEIVED: 5-8-86

Lab No.	Field No.	As	Cd	Cu	Pb	Sb	Zn
W3265	Well #1	<0.002	<0.007	<0.04	<0.006	<0.1	0.036
W3266	Well #2	<0.002	<0.007	<0.04	<0.006	<0.1	0.013
W3267	Well #3	<0.002	<0.007	<0.04	<0.006	<0.1	0.115

All results as mg/L dissolved metal.

Lab Director

RECEIVED
JUL 2 1986
MONTANA DEPT. OF HEALTH
& ENV. SCIENCES
WATER QUALITY BUREAU

CLIENT: MEDALLION MINERALS

SAMPLES RECEIVED: 2/18/86

Field No	Lab No.	As	Cd	Cu	Pb	Sb	Zn
#1 Well 2-86	W3160	<0.0023	0.0004	<0.009	<0.0009	<0.062	0.008
#2 Well 2-86	W3161	<0.0023	0.0004	<0.009	0.0093	<0.062	0.025
#3 Well 2-86	W3162	<0.0023	0.0004	<0.009	<0.0009	<0.062	0.204

All concentrations reported as mg/L dissolved metals.

Lab Director Clarence White

PROJECT NAME: MEDALLION MINERALS SAMPLES RECEIVED: 1/31/86

Analysis for As, Cd, Cu, Pb, Sb, Zn

Lab NO.	Field ID	As	Cd	Cu	Pb	Sb	Zn
W3150	Well #1	0.0258	<0.0004	<0.005	<0.0047	<0.014	0.013
W3151	Well #2	0.0137	0.0004	0.008	0.0078	<0.014	0.046
W3152	Well #3	0.0099	<0.0004	<0.005	<0.0047	<0.014	0.212

All concentrations are reported in mg/L.

Lab Director

PROJECT NAME: MEDALLION MINERALS

DATE RECEIVED: 12-6-85

DISS. METALS: UNITS: mg/l

Lab ID	Field ID	Date Collected	As	Sb	Cd	Cu	Pb	Zn
W2999	Well #1	NOV.	<0.0018	<0.067	0.0005	<0.014	<0.0002	0.04
W3000	Well #2	NOV.	<0.0018	<0.067	0.0005	<0.014	0.0039	0.02
W3001	Well #3	NOV.	<0.0018	<0.067	0.0002	<0.014	0.0007	0.16
W3002	Well #1	DEC.	<0.0018	<0.067	0.0002	<0.014	0.0004	0.04
W3003	Well #2	DEC.	<0.0018	<0.067	<0.0001	<0.014	0.0007	0.02
W3004	Well #3	DEC.	<0.0018	<0.067	0.0003	<0.014	0.0003	0.15

Lab Director

CLIENT: Medallion Minerals

SAMPLES RECEIVED: 5/13/85

SAMPLES COMPLETED: 5/23/85

Lab ID	Field ID	As	Cd	Cu	Fe	Pb ~~Sb~~	Zn
W1938	Basin Creek	<0.005	0.057	<0.021	0.131	<0.0048	0.064
W1939	Boulder River	<0.005	< .001	<0.021	0.156	0.0048	0.042
W1940	Well #1	<0.005	< .001	<0.021	0.167	<0.0048	0.040
W1941	Well #2	<0.005	< .001	<0.021	0.263	<0.0048	0.008
W1942	Well #3	<0.005	< .001	<0.021	0.017	<0.0048	0.103

All results reported in mg/L

Lab Director Clarence Whitworth

CLIENT: Medallion Minerals

SAMPLES RECEIVED: 6/13/85

SAMPLES COMPLETED: 7/9/85

Lab ID	Field ID	As	Sb	Zn	Pb	Cu	Cd
W2500	Well #1	<0.0048	<0.008	0.010	<0.009	0.011	<0.0004
W2501	Well #2	<0.0048	<0.008	0.039	<0.009	0.005	<0.0004
W2502	Well #3	<0.0048	<0.008	0.125	<0.009	0.020	0.0004

All results reported in mg/L

Lab Director Clarence Whitehead

WQB
collected splits for these

CLIENT: Medallion Minerals

SAMPLES RECEIVED: 7/22/85

Field ID	Lab ID	As	Sb	Zn	Cd	Pb	Cu
W2596	well #1	<0.010	<0.015	0.046	0.0040	<0.0045	0.003
W2597	well #2	<0.010	<0.015	0.031	0.0120	0.0056	0.013
W2598	well #3	<0.010	<0.015	0.120	0.0010	0.014	0.019

Results reported in mg/L.

Lab Director

PROJECT NAME: MEDALLION MINERALS

SAMPLES RECEIVED: 8-14-85

REPORTED UNITS: mg/L Diss. Metal

Lab ID	Field ID	As	Cd	Cu	Pb	Sb	Zn
W2727	Well #1 Basin	<0.0044	0.001	<0.084	.001	<0.001	0.032
W2728	Well #2	<0.0044	0.0002	<0.084	0.0065	0.001	0.023
W2729	Well #3	<0.0044	0.004	?<0.084	<0.001	0.001	0.177

Lab Director

[illegible] permit [illegible] we are enclosing [illegible] monitoring for all [illegible] wells

[illegible] MINERALS, Inc.

RECEIVED

PROJECT NAME: MEDALLION MINERALS SAMPLES RECEIVED: 9-13-85

REPORTED UNITS: mg/L Diss. Metal

Lab ID	Field ID	As	Cd	Cu	Pb	Sb	Zn
W2848	Basin Creek	.0133	0.0004	<0.084	<0.001	<0.001	0.058
W2849	Well # 1	<0.044	0.0003	<0.084	0.0015	<0.001	0.043
W2850	Well #2	<0.044	0.0004	<0.084	<0.001	0.002	0.037
W2851	Well #3	<0.044	0.0005	<0.084	<0.001	<0.001	0.151

decimal wrong?
<.0044?

Lab Director

MultiTech

PROJECT NAME: MEDALLION MINERALS

SAMPLES RECEIVED: 11/15/85

SAMPLES REPORTED: 12/04/85

Lab NO.	Field ID	As	Cd	Cu	Pb	Sb	Zn
W2956	#1 Well	<0.005	<0.003	<0.010	<0.002	<0.020	0.034
W2957	#2 Well	<0.005	<0.003	0.010	0.003	<0.020	0.017
W2958	#3 Well	<0.005	<0.003	<0.010	<0.002	<0.020	0.161

All concentrations are reported in mg/L.

Lab Director

MultiTech

CLIENT: MEDALLION MINERALS SAMPLES RECEIVED: 2/18/86

Field No.	Lab No.	As	Cd	Cu	Pb	Sb	Zn
#1 Well 2-86	W3160	<0.0023	0.0004	<0.009	<0.0009	<0.062	0.008
#2 Well 2-86	W3161	<0.0023	0.0004	<0.009	0.0093	<0.062	0.025
#3 Well 2-86	W3162	<0.0023	0.0004	<0.009	<0.0009	<0.062	0.204

All concentrations reported as mg/L dissolved metals.

Lab Director Clarence White

MultiTech

CLIENT: MEDALLION MINERALS

SAMPLES RECEIVED: 2/18/86

Field No	Lab No.	As	Cd	Cu	Pb	Sb	Zn
#1 Well 2-86	W3160	<0.0023	0.0004	<0.009	<0.0009	<0.062	0.008
#2 Well 2-86	W3161	<0.0023	0.0004	<0.009	0.0093	<0.062	0.025
#3 Well 2-86	W3162	<0.0023	0.0004	<0.009	<0.0009	<0.062	0.204

All concentrations reported as mg/L dissolved metals.

Lab Director Clarence White

CLIENT: Madallion Minerals

SAMPLES RECEIVED: 4/12/85

SAMPLES COMPLETED: 4/18/85

Field ID	Lab ID	As	Cd	Cu	Fe	Sb	Zn
well #1 sample 1	W1738	<0.011	<0.001	<0.041	0.100	<0.228	0.013
well #1 sample 2	W1739	<0.011	<0.001	<0.041	0.217	<0.228	0.034
well #2 sample 1	W1740	<0.011	<0.001	<0.041	0.054	<0.228	0.035
well #2 sample 2	W1741	<0.011	<0.001	<0.041	0.115	<0.228	0.072
Boulder River Upstream	W1742	<0.011	<0.001	<0.041	0.253	<0.228	0.034

Results reported in mg/L

Lab Director Clarence Whitworth

Cumberland Mining Corporation
A SUBSIDIARY OF CUMBERLAND RESOURCES, INC.
1100 East Front Street • Butte, Montana 59701
(406) 782-4261

April 27, 1984

Fred Shewman, P. E.
Water Quality Bureau
Capitol Station
Helena, Montana 59620

Dear Mr. Shewman,

As required in permit No. MGWPCS0014, I am reporting the results of sampling done at our mill in Basin, Montana during March and April, 1984. The results are shown below. It should be noted that as of March 14, 1984 our milling operations will be temporarily shut down.

were?

Sample Location	Date Collected	Mg/l Cd	Mg/l Cu	Mg/l Zn
#1 Well	3-03-84	<0.01	<0.03	0.032
#2 Well	3-03-84	<0.01	<0.03	0.028
Mill Discharge	3-03-84	<0.01	<0.03	0.258
#1 Well	3-10-84	<0.01	<0.03	0.017
#2 Well	3-10-84	0.025	<0.03	0.062
Mill Discharge	3-10-84	0.026	<0.03	0.079
#1 Well	4-16-84	<0.01	<0.03	0.011
#2 Well	4-16-84	<0.01	<0.03	0.023

Sincerely,

CUMBERLAND MINING CORP.

by
Kerry C. Gee
Chief Geologist
Cumberland Mining Corp.

pc: M. Batten
L. Braunbeck
J. Knowlson
M. Salusso
K. Stout
file

CUMBERLAND MINING CORPORATION

February Water Analysis

Sample Location	Date Collected	Mg/1 Cd	Mg/1 Cu	Mg/1 Zn
Well #1	2-05-84	0.016	<0.03	0.012
Well #2	2-05-84	0.014	<0.03	0.019
Mill Discharge	2-05-84	<0.01	<0.03	0.215 ✗
Mill Discharge	2-07-84	0.01	<0.03	0.091
Well #1	2-12-84	<0.01	<0.03	0.043
Well #2	2-12-84	<0.01	0.042	0.063
Mill Discharge	2-12-84	0.01	<0.03	0.058
Well #1	2-19-84	<0.01	<0.03	0.046
Well #2	2-19-84	<0.01	<0.03	0.068
Mill Discharge	2-19-84	<0.01	<0.03	0.147 ✗
Well #1	2-25-84	<0.01	<0.03	0.01
Well #2	2-25-84	<0.01	<0.03	0.017
Mill Discharge	2-25-84	<0.01	<0.03	0.017

Cumberland Mining Corporation
A SUBSIDIARY OF CUMBERLAND RESOURCES, INC.
1100 EAST FRONT STREET • BUTTE, MONTANA 59701
(406) 782-

... in reference to ... Cumberland ... dated February ... I am sending you additional information that I received on February 28, 1984.

Sample	Date	Time	Mg/1 Cd	Mg/1 Cu	Mg/1 Zn
Well #1	2/12/84	1:00PM	<0.01	<0.03	[illegible]
Well #2	2/12/84	2:00PM	<0.01	0.042	[illegible]
Mill Discharge	2/12/84	3:00PM	[illegible]	0.03	0.058
Boulder River	2/17/84	4:20PM	<0.01	<0.03	[illegible]
Well #1	2/19/84	2:00PM	<0.01	<0.03	[illegible]
Well #2	2/19/84	3:00PM	<0.01	<0.01	[illegible]
Mill Discharge	2/19/84	11:00AM	<0.01	<0.03	0.147

If you have any questions, please call our office.

Sincerely,

Kerry C. [illegible]

KERRY C. [illegible]
Chief Geologist
Cumberland Mining Corp.

pc: [illegible] Batten
[illegible] Braunbeck
[illegible]
[illegible]
[illegible]
[illegible]

Cumberland Mining Corporation
A SUBSIDARY OF CUMBERLAND RESOURCES, INC.
1100 EAST FRONT STREET • BUTTE, MONTANA 59701
(406) 782-8958

February 29, 1984

Mr. Fred Shewman, P. E.
Water Quality Bureau
Capitol Station
Helena, Montana 59620

Dear Mr. Shewman,

In reference to correspondence from Cumberland dated February 20, 1984, I am sending you additional information that I received on February 28, 1984.

Sample	~~Dat~~Date	Time	mg/l Cd	mg/l Cu	mg/l Zn
Well #1	2/12/84	1:00PM	<0.01	<0.03	0.043
Well #2	2/12/84	2:00PM	<0.01	0.042	0.064
Mill Discharge	2/12/84	3:00PM	0.01	<0.03	0.058
Boulder River	2/17/84	4:20PM	<0.01	<0.03	0.091
Well #1	2/19/84	2:00PM	<0.01	<0.03	0.046
Well #2	2/19/84	3:00PM	<0.01	<0.03	0.068
Mill Discharge	2/19/84	11:00AM	<0.01	<0.03	0.147

If you have any questions, please call our office.

Sincerely,

KERRY C. GEE
Chief Geologist
Cumberland Mining Corp.

pc: M. Batten
L. Braunbeck
J. Knowlson
M. Salusso
K. Stout
file

Cumberland Mining Corporation
A SUBSIDARY OF CUMBERLAND RESOURCES, INC.
1100 EAST FRONT STREET • BUTTE, MONTANA 59701
(406) 782-8958

February 20, 1984

Fred Shewman, P. E.
Water Quality Bureau
Capitol Station
Helena, Montana 59620

Dear Mr. Shewman,

In reference to our telephone conversation of 2/17/84, I am sending some additional results of our sampling at Basin, Montana. These results are listed below:

Sample	Date	Time	mg/l Cd	mg/l Cu	mg/l Zn
Mill Discharge	2-5-84	1100AM	<0.01	<0.03	0.215 *
Well # 1	2-5-84	430PM	0.016	<0.03	0.012
Well # 2	2-5-84	400PM	0.014	<0.03	0.019
Mill Discharge	2-7-84	440PM	0.010	<0.03	0.091
Mill Fresh Water	2-5-84	1235PM	<0.010	<0.03	0.121
Boulder River	2/7-84	503PM	<0.01	0.095	0.281

Unlike any previous samples these samples were filtered with a 0.45 micron membrane filter.

As I mentioned in my letter to you dated 1-27-84, we are milling rock from mine dumps that have been exposed to surface weathering for a very long time. The dumps contain varying amounts of precious and base metals. The original zinc mineralogy in these dumps was probably sphalerite, a zinc sulfide (ZnFe)S. Due to weathering and decomposition of the sphalerite it is possible that some water soluble hydrous zinc sulfates were formed. As water is added to the crushed rock in the grinding circuit, these sulfates would dissolve.

Sample Location	Date Collected	mg/l Cd	mg/l Cu	mg/l Zn
Well #1	1-6-84	<0.01	<0.03	0.241
Well #2	1-6-84	<0.01	<0.03	0.184
Mill Discharge	1-6-84	0.017	<0.03	0.934
Well #1	1-14-84	<0.01	0.078	0.332
Well #2	1-14-84	<0.01	<0.03	0.069
Mill Discharge	1-14-84	0.026	<0.03	3.049
Well #1	1-21-84	0.015	0.051	0.132
Well #2	1-21-84	0.015	<0.03	0.434
Mill Discharge	1-21-84	0.025	<0.03	1.724
Well #1	1-29-84	<0.01	0.088	0.148
Well #2	1-29-84	<0.01	<0.03	0.084
Mill Discharge	1-29-84	<0.01	<0.03	1.131

Sample Location	Date Collected	mg/l Cd	mg/l Cu	mg/l Zn
Well #1	1-6-84	<0.01	<0.03	0.241
Well #2	1-6-84	<0.01	<0.03	0.184
Mill Discharge	1-6-84	0.017	<0.03	0.934
Well #1	1-14-84	<0.01	0.078	0.332
Well #2	1-14-84	<0.01	<0.03	0.069
Mill Discharge	1-14-84	0.026	<0.03	3.049
Well #1	1-21-84	0.015	0.051	0.132
Well #2	1-21-84	0.015	<0.03	0.434
Mill Discharge	1-21-84	0.025	<0.03	1.724
Well #1	1-29-84	<0.01	0.088	0.148
Well #2	1-29-84	<0.01	<0.03	0.084
Mill Discharge	1-29-84	<0.01	<0.03	1.131

```
STATE HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59620

        STATE   MONTANA                                  COUNTY  JEFFERSON
     LAT.-LONG.  461616N 1121507W                SAMPLE LOCATION  6N  5W 17DB
   STATION CODE                                  ANALYSIS NUMBER  85W1421
   DATE SAMPLED  06-06-85                         DRAINAGE BASIN  041E -BOULDER R.
   TIME SAMPLED                                  WATER FLOW RATE
METHOD SAMPLED  GRAB                       FLOW MEASUREMENT METHOD
  SAMPLE SOURCE  WELL                     ALTITUDE OF LAND SURFACE   5336.7 FT
      WATER USE                          TOTAL WELL DEPTH BELOW LS    152 FT (R)
    AQUIFER(S)                            SWL ABOVE(+) OR BELOW LS    52.3 FT (M)
    SAMPLED BY  WGSH                     SAMPLE DEPTH BELOW SURFACE

       SAMPLING SITE: MEDALLICN MINING & MILLING WELL NO.1

                      MG/L      MEQ/L                            MG/L      MEQ/L
  CALCIUM (CA)                            BICARBONATE(HCO3)
MAGNESIUM (MG)                              CARBONATE (CO3)
   SODIUM (NA)                               CHLORIDE  (CL)
POTASSIUM  (K)                               SULFATE (SO4)
                                             FLUORIDE   (F)
                                         PHOSPHATE(PO4 AS P)
                                          NO3+NO2 (TOT AS N)

                    ------    ------                        ------    ------
    SUM CATIONS      0.0      0.000          SUM ANIONS      0.0      0.000

              LABORATORY PH                  TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (NTU)
 LAB CONDUCTIVITY-UMHOS-25C                    SODIUM ADSORPTION RATIO

                   A D D I T I O N A L   P A R A M E T E R S
  ARSENIC,TR (MG/L AS AS)       .001     CADMIUM, TR (MG/L AS CD)      <.005
   COPPER,TR (MG/L AS CU)       .02          LEAD,TR (MG/L AS PB)      <.05
     ZINC,TR (MG/L AS ZN)       .010         IRON,TR (MG/L AS FE)       .18




EMARKS:                               COMPLIANCE MONITORING

OTES: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVALENTS/L  UG/L=MICROGRAMS/L
LL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL  SUSP=SUSPENDED
R=TOTAL RECOVERABLE (M)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO-          SAMPLER-JLA  HANDLING-111   ANALYST-LAB  LAB-      SCAN-NO
COMPLETED-06/20/85  COMPUTER RUN-07/02/85  DATA-0624/PGM-0984  FUND-0543
STND DEV. ION BALANCE=           CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
MPDES-                           0.0   0.0   0.0  0.0   0.0  0.0  0.0   0.0  0.0
CALC. MEQ/L= SC N/A. NO CALC.                                            85W1421
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STATE HEALTH DEPT.        WATER QUALITY BUREAU        HELENA, MONTANA  59620

        STATE  MONTANA                                    COUNTY  JEFFERSON
     LAT.-LONG.  461616N 1121507W            SAMPLE LOCATION   6N  5W 17DB
  [illegible]ATION CODE                             ANALYSIS NUMBER  85W1422
  DATE SAMPLED  06-06-85                     DRAINAGE BASIN  041E -BOULDER R.
  TIME SAMPLED                               WATER FLOW RATE
METHOD SAMPLED  GRAB                   FLOW MEASUREMENT METHOD
 SAMPLE SOURCE  WELL                  ALTITUDE OF LAND SURFACE   5340.2 FT
     WATER USE                       TOTAL WELL DEPTH BELOW LS     75 FT (R)
    AQUIFER(S)                        SWL ABOVE(+) OR BELOW LS    55.8 FT (M)
    SAMPLED BY  WQBH                 SAMPLE DEPTH BELOW SURFACE

      SAMPLING SITE: MEDALLION MINING & MILLING WELL NO.2

                  MG/L     MEQ/L                              MG/L      MEQ/L
  CALCIUM (CA)                            BICARBONATE(HCO3)
MAGNESIUM (MG)                              CARBONATE (CO3)
   SODIUM (NA)                               CHLORIDE  (CL)
POTASSIUM  (K)                                SULFATE (SO4)
                                             FLUORIDE   (F)
                                          PHOSPHATE(PO4 AS P)
                                           NO3+NO2 (TOT AS N)

                  ------    ------                           ------    ------
    SUM CATIONS     0.0     0.000           SUM ANIONS         0.0     0.000

              LABORATORY PH                 TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
   -DISS. IONS MEAS.(MG/L)                LABORATORY TURBIDITY (NTU)
LAB CONDUCTIVITY-UMHOS-25C                   SODIUM ADSORPTION RATIO

                 ADDITIONAL  PARAMETERS
  ARSENIC,TR (MG/L AS AS)      <.001   CADMIUM, TR (MG/L AS CD)      <.005
   COPPER,TR (MG/L AS CU)        .02        LEAD,TR (MG/L AS PB)      <.05
     ZINC,TR (MG/L AS ZN)       .031        IRON,TR (MG/L AS FE)      <.01




REMARKS:                              COMPLIANCE MONITORING

NOTES: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVALENTS/L  UG/L=MICROGRAMS/L
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
TR=TOTAL RECOVERABLE (M)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO-         SAMPLER-JLA  HANDLING-111   ANALYST-LAB  LAB-      SCAN-NO
C[illegible]LETED-06/20/85  COMPUTER RUN-07/02/85  DATA-0684/PGM-0984  FUND-0543
S[illegible] DEV. ION BALANCE=            CA   MG   NA   K   CL  SO4  HCO3  CO3  NO3
NPDES-                            0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
CALC. MEQ/L= SC N/A, NO CALC.                                         85W1422
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STATE HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59620

        STATE  MONTANA                                    COUNTY  JEFFERSON
    LAT.-LONG.  461616N 1121507W                SAMPLE LOCATION   6N  5W 1708
  STATION CODE                                  ANALYSIS NUMBER  85W1423
  DATE SAMPLED  06-06-85                         DRAINAGE BASIN  041E -BOULDER R.
  TIME SAMPLED                                  WATER FLOW RATE
METHOD SAMPLED  GRAB                    FLOW MEASUREMENT METHOD
 SAMPLE SOURCE  WELL                   ALTITUDE OF LAND SURFACE   5341.8 FT
     WATER USE                        TOTAL WELL DEPTH BELOW LS    150 FT
    AQUIFER(S)                          SWL ABOVE(+) OR BELOW LS    55.8 FT (M)
    SAMPLED BY  WQBH                  SAMPLE DEPTH BELOW SURFACE

      SAMPLING SITE: MEDALLION MINING & MILLING WELL NO.3

                   MG/L      MEQ/L                            MG/L      MEQ/L
  CALCIUM (CA)                            BICARBONATE(HCO3)
MAGNESIUM (MG)                              CARBONATE (CO3)
   SODIUM (NA)                               CHLORIDE  (CL)
POTASSIUM  (K)                                SULFATE (SO4)
                                             FLUORIDE   (F)
                                        PHOSPHATE(PO4 AS P)
                                         NO3+NO2 (TOT AS N)

                  ------    ------                       ------    ------
    SUM CATIONS    0.0      0.000             SUM ANIONS   0.0      0.000

             LABORATORY PH                 TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (NTU)
 LAB CONDUCTIVITY-UMHOS-25C                  SODIUM ADSORPTION RATIO

                 ADDITIONAL  PARAMETERS
  ARSENIC,TR (MG/L AS AS)    <.001   CADMIUM, TR (MG/L AS CD)    <.005
   COPPER,TR (MG/L AS CU)     .02        LEAD,TR (MG/L AS PB)    <.05
     ZINC,TR (MG/L AS ZN)     .118       IRON,TR (MG/L AS FE)    <.01










REMARKS:                             COMPLIANCE MONITORING

NOTES: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVALENTS/L  UG/L=MICROGRAMS/L
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
TR=TOTAL RECOVERABLE (M)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO-          SAMPLER-JLA  HANDLING-111   ANALYST-LAB  LAB-      SCAN-NO
COMPLETED-06/20/85  COMPUTER RUN-07/02/85  DATA-0684/PGM-0984  FUND-0543
STND DEV. ION BALANCE=          CA   MG   NA    K   CL  SO4  HCO3  CO3  NO3
NPDES-                          0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
CALC. MEQ/L= SC N/A. NO CALC.                                          85W1423
```

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STATE HEALTH DEPT.        WATER QUALITY BUREAU        HELENA, MONTANA  59620

        STATE  MONTANA                                  CCUNTY  JEFFERSCN
    LAT.-LCNG.  461619N 1121512W               SAMPLE LCCATION   6N   5W 17DBB
  STATION CCDE                                 ANALYSIS NUMBER  84W0235
  DATE SAMFLED  03-05-84                        DRAINAGE BASIN   41E
  TIME SAMPLED                                 WATER FLOW RATE
METHOD SAMFLED                          FLOW MEASUREMENT METHCD
 SAMPLE SCURCE  WELL                   ALTITUDE OF LAND SURFACE
     WATER USE                        TCTAL WELL DEPTH BELCW LS
   AQUIFER(S)                          SWL ABOVE(+) OR BELOW LS
    SAMPLED BY  WQBH                 SAMPLE DEPTH BELOW SURFACE    90.  FT

       SAMPLING SITE: CUMBERLAND MINING WELL NO # NR BASIN
                                                1
                    MG/L      MEQ/L                              MG/L      MEQ/L
  CALCIUM (CA)                          BICARBONATE(HCO3)
MAGNESIUM (MG)                            CARBONATE (CO3)
   SODIUM (NA)                             CHLORIDE  (CL)
POTASSIUM  (K)                              SULFATE (SO4)
                                           FLUORIDE   (F)
                                      FHOSPHATE(PO4 AS P)
                                       NO3+NO2 (TOT AS N)
                   ------    ------                        ------     ------
   SUM CATIONS      0.0      0.000           SUM ANIONS      0.0       0.000

              LABORATORY PH                   TOT HARDNESS(MG/L-CACO3)
F[illegible]D WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)                LABORATORY TURBIDITY (NTU)
 LAB CONDUCTIVITY-UMHOS-25C                  SODIUM ADSORPTION RATIO

                 ADDITIONAL  PARAMETERS
  ARSENIC,TR (MG/L AS AS)      .072    CADMIUM, TR (MG/L AS CD)    < .005
   COPPER,TR (MG/L AS CU)      .05         LEAD,TR (MG/L AS PB)      .84
     ZINC,TR (MG/L AS ZN)      .24         IRON,TR (MG/L AS FE)     8.65




REMARKS: CUMBERLAND MINING

EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEGUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
S[illegible]PLE NO-          SAMPLER-LLB  HANDLING-1100  ANALYST-WAT  LAB-      SCAN-NO
C[illegible]PLETED-03/22/84  COMPUTER RUN-04/02/84  DATA-0383/PGM-0983  FUND-2054
STND DEV. ION BALANCE=           CA    MG    NA    K     CL    SO4   HCO3  CO3   NO3
MPDES-                           0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
CALC. MEQ/L= SC N/A, NO CALC.                                             84W0235
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STATE HEALTH DEPT.        WATER QUALITY BUREAU        HELENA, MONTANA  59620

          STATE  MONTANA                                    COUNTY  JEFFERSON
      LAT.-LONG.  461619N 1121512W              SAMPLE LOCATION   6N  5W 17DBB
    STATION CODE                                ANALYSIS NUMBER  84W0236
    DATE SAMPLED  03-05-84                       DRAINAGE BASIN   41E
    TIME SAMPLED                                WATER FLOW RATE
  METHOD SAMPLED                       FLOW MEASUREMENT METHOD
   SAMPLE SOURCE  WELL                 ALTITUDE OF LAND SURFACE
       WATER USE                      TOTAL WELL DEPTH BELOW LS
      AQUIFER(S)                       SWL ABOVE(+) OR BELOW LS
      SAMPLED BY  WQBH                SAMPLE DEPTH BELOW SURFACE    50.  FT

         SAMPLING SITE: CUMBERLAND MINING WELL NO 2 NR BASIN

                      MG/L      MEQ/L                              MG/L      MEQ/L
   CALCIUM (CA)                            BICARBONATE(HCO3)
 MAGNESIUM (MG)                              CARBONATE (CO3)
    SODIUM (NA)                               CHLORIDE  (CL)
 POTASSIUM  (K)                                SULFATE (SO4)
                                              FLUORIDE   (F)
                                        PHOSPHATE(PO4 AS P)
                                         NO3+NO2 (TOT AS N)

                    ------     ------                         ------     ------
     SUM CATIONS      0.0      0.000          SUM ANIONS        0.0      0.000

                LABORATORY PH                 TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)                  TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)                  LABORATORY TURBIDITY (NTU)
 LAB CONDUCTIVITY-UMHOS-25C                     SODIUM ADSORPTION RATIO

                   A D D I T I O N A L   P A R A M E T E R S
  ARSENIC,TR (MG/L AS AS)          .013   CADMIUM, TR (MG/L AS CD)       .01
   COPPER,TR (MG/L AS CU)          .02       LEAD,TR (MG/L AS PB)        .15
     ZINC,TR (MG/L AS ZN)          .32       IRON,TR (MG/L AS FE)      31.1



REMARKS: CUMBERLAND MINING

EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO-         SAMPLER-LLB  HANDLING-1100  ANALYST-LAB  LAB-       SCAN-NO
COMPLETED-03/22/84  COMPUTER RUN-04/02/84  DATA-0383/PGM-0983  FUND-2054
STND DEV. ION BALANCE=           CA   MG   NA    K   CL  SO4  HCO3  CO3  NO3
NPDES -                         0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
CALC. MEQ/L= SC N/A, NO CALC.                                       84W0236
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STATE HEALTH DEPT.        WATER QUALITY BUREAU        HELENA, MONTANA  59620

         STATE  MONTANA                                  COUNTY  JEFFERSON
    LAT.-LONG.  461553N 1121703W                SAMPLE LOCATION   6N  5W 19BBB
  STATION CODE                                  ANALYSIS NUMBER  84W0238
  DATE SAMPLED  03-05-84                         DRAINAGE BASIN   41E
  TIME SAMPLED                                  WATER FLOW RATE       40.  CFS(E)
METHOD SAMPLED                          FLOW MEASUREMENT METHOD  NOT MEASURED
 SAMPLE SOURCE  STREAM                 ALTITUDE OF LAND SURFACE
     WATER USE                        TOTAL WELL DEPTH BELOW LS
    AQUIFER(S)                         SWL ABOVE(+) OR BELOW LS
    SAMPLED BY  WQBH                  SAMPLE DEPTH BELOW SURFACE

         SAMPLING SITE: BOULDER RIVER 1 MILE WEST OF BASIN

                      MG/L      MEQ/L                              MG/L      MEQ/L
  CALCIUM (CA)                            BICARBONATE(HCO3)
MAGNESIUM (MG)                              CARBONATE (CO3)
   SODIUM (NA)                               CHLORIDE  (CL)
POTASSIUM  (K)                                SULFATE (SO4)
                                             FLUORIDE   (F)
                                         PHOSPHATE(PO4 AS P)
                                          NO3+NO2 (TOT AS N)

                    -----      -----                           -----      -----
   SUM CATIONS       0.0      0.000           SUM ANIONS        0.0      0.000

              LABORATORY PH                 TOT HARDNESS(MG/L-CACO3)
F  LD WATER TEMPERATURE (C)      0.0     TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
 LAB CONDUCTIVITY-UMHOS-25C                 SODIUM ADSORPTION RATIO

                 A D D I T I O N A L   P A R A M E T E R S
  ARSENIC,TR (MG/L AS AS)      .002     CADMIUM, TR (MG/L AS CD)      < .005
   COPPER,TR (MG/L AS CU)    < .01          LEAD,TR (MG/L AS PB)        .06
     ZINC,TR (MG/L AS ZN)      .009         IRON,TR (MG/L AS FE)        .25




REMARKS: CUMBERLAND MINING          RIVER ICED OVER

EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
S  PLE NO-          SAMPLER-LLE  HANDLING-1100  ANALYST-LAB  LAB-        SCAN-NO
C  PLETED-03/22/84  COMPUTER RUN-04/02/84  DATA-0383/PGM-0983  FUND-2054
STND DEV. ION BALANCE=            CA   MG   NA    K   CL  SO4 HCO3  CO3  NO3
MPOES-                           0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
CALC. MEQ/L= SC N/A, NO CALC.                                         84W0238
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STATE HEALTH DEPT.        WATER QUALITY BUREAU         HELENA, MONTANA  59620

        STATE  MONTANA                                   COUNTY  JEFFERSON
    LAT.-LONG.  461616N 1121430W               SAMPLE LOCATION   6N  5W 16CB
  STATION CODE                                 ANALYSIS NUMBER  84W0237
  DATE SAMPLED  03-05-84                        DRAINAGE BASIN   41E
  TIME SAMPLED                                 WATER FLOW RATE     40.  CFS(E)
METHOD SAMPLED                        FLOW MEASUREMENT METHOD  NOT MEASURED
 SAMPLE SOURCE  STREAM                ALTITUDE OF LAND SURFACE
     WATER USE                       TOTAL WELL DEPTH BELOW LS
    AQUIFER(S)                        SWL ABOVE(+) OR BELOW LS
    SAMPLED BY  WQBH                SAMPLE DEPTH BELOW SURFACE

        SAMPLING SITE: BOULDER RIVER ABOVE CATARACT CK NR BASIN

                     MG/L      MEQ/L                             MG/L      MEQ/L
  CALCIUM (CA)                           BICARBONATE(HCO3)
MAGNESIUM (MG)                             CARBONATE (CO3)
   SODIUM (NA)                              CHLORIDE   (CL)
POTASSIUM   (K)                              SULFATE (SO4)
                                            FLUORIDE    (F)
                                       PHOSPHATE(PO4 AS P)
                                        NO3+NO2 (TOT AS N)

                   ------      ------                        ------      ------
   SUM CATIONS      0.0        0.000         SUM ANIONS       0.0        0.000

              LABORATORY PH                    TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)      0.0     TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
 LAB CONDUCTIVITY-UMHOS-25C                 SODIUM ADSORPTION RATIO

                    A D D I T I O N A L   P A R A M E T E R S
  ARSENIC,TR (MG/L AS AS)       .003    CADMIUM, TR (MG/L AS CD)      < .005
   COPPER,TR (MG/L AS CU)       .02          LEAD,TR (MG/L AS PB)       .04
     ZINC,TR (MG/L AS ZN)       .05          IRON,TR (MG/L AS FE)       .30



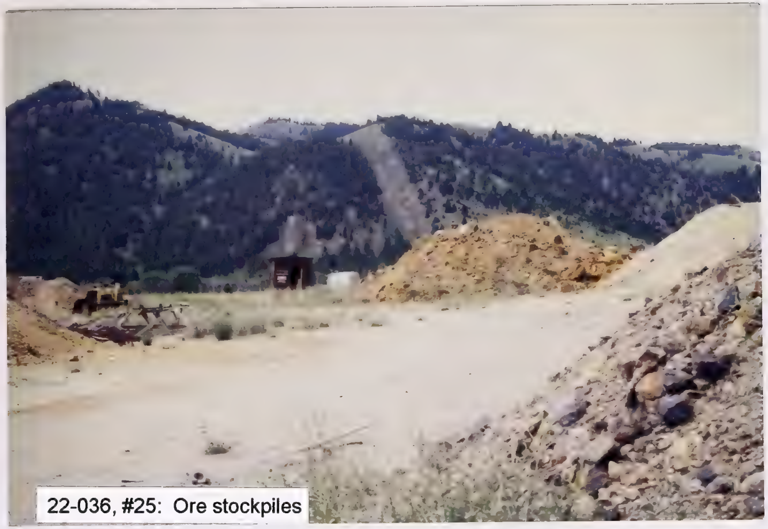




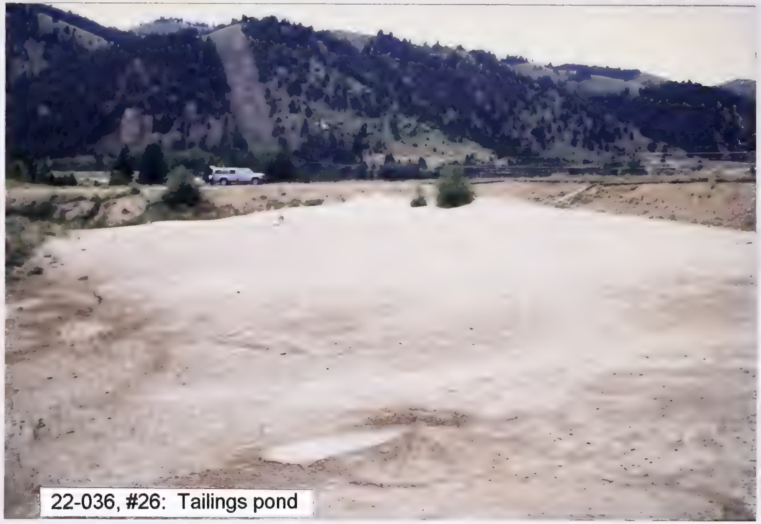



REMARKS: CUMBERLAND MINING          RIVER ICED OVER

EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO-          SAMPLER-LLB  HANDLING-1100  ANALYST-LAB  LAB-        SCAN-NO
COMPLETED-03/22/84  COMPUTER RUN-04/02/84  DATA-0383/PGM-0983  FUND-2054
STND DEV. ION BALANCE=            CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
MPDES-                           0.0   0.0   0.0   0.0  0.0   0.0   0.0  0.0  0.0
CALC. MEQ/L= SC N/A, NO CALC.                                            84W0237
```



22-036, #25: Ore stockpiles



22-036, #26: Tailings pond

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: PERRY PARK **PA#:** 22-039

Date: July 9, 1993 **Time:** 1700

Field Team Leader: Babits, Pioneer

Sampling Personnel: Bullock, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Cool (45°F); scattered showers; breezy (5-10 mph); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** #35: Overview; #36: Overview. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: No remediation is necessary.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): PERRY PARK PA#: 22-039

Legal Description: T 8N ;R 6W ;Sec. 36 , NW1/4 SW1/4 ___ 1/4

County: JEFFERSON Mining District: BASIN

Latitude: N 46° 24' 03" Longitude: W 112° 18' 02"

Primary Drainage Basin and Code: Basin Creek/10020006
Secondary Drainage Basin: Grub Gulch

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Placer/Gold

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Frank and Patricia McCarty, 4760 Kellogg Circle, Boulder, CO 80303. (303) 444-4397; Glenn Kenney, 2001 Eleventh Avenue, Helena, MT 59601. (406) 443-4428; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: North of Buckeye and Enterprise sites.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7200', Slope 10°,
Aspect West

Land use: Mining___, Recreational___, Residential___, Urban___,
Agricultural___, Other(Specify) Logging

Area of disturbed/unvegetated lands? 7 acres.
Dimensions: 262 feet x 1,110 feet

Predominant vegetation types: Fir, grasses

Access: roads - good___,poor X ,4wd X ,trail___.
Other logistical considerations (proximity to other sites). One mile north of Buckeye site.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 7 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by cretaceous and tertiary volcanic rocks and granitic rocks of the Boulder Batholith. Site lies in perennial drainage of Grub Gulch which flows east through the site. Grub Gulch flows into Basin Creek approx. 1/2 mile below the placer near Basin Creek headwaters.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?

Shafts - Yes___, No X, # ____, Comment

Adits - Yes___, No X, # ____, Comment

Pits - Yes___, No X, # ____, Comment

Placers - Yes X, No___, # ____, Comment

Other - Yes___, No X, # ____, Comment

Mill Operation? Yes____, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

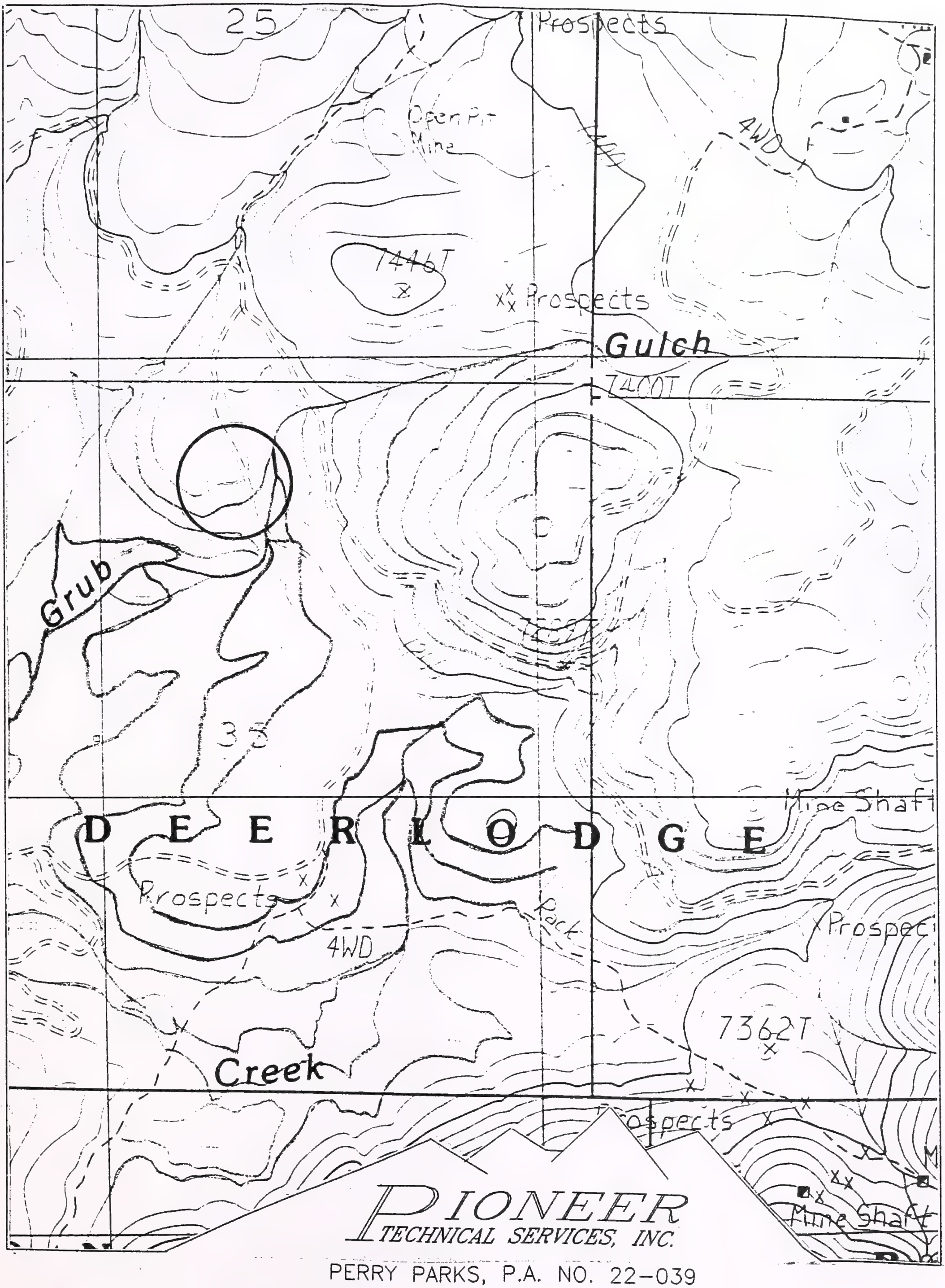
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting? N/A

Montana Bureau of Mines and Geology
Water Well Log Data

11/03/1993

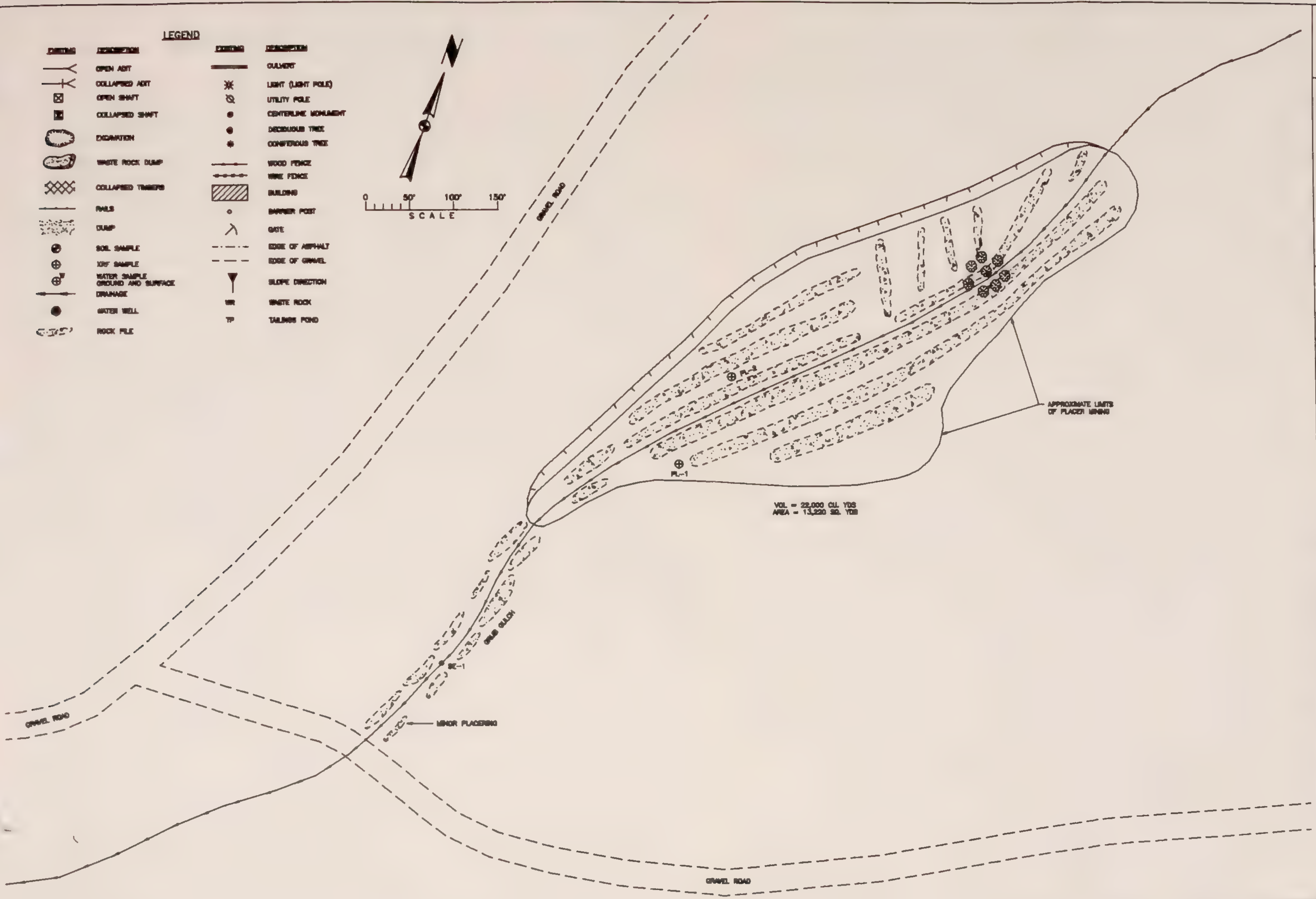
Well No.	Location	Depth	Yield	Static Water Level
M:57349	08N 06W 25 CA	100.0	25.0	0.00
M:57350	08N 06W 25 CA	250.0	80.0	18.00
M:120003	08N 06W 25 CAC	210.0	15.0	11.00
M:121731	08N 06W 35	60.0	0.0	0.00
M:121730	08N 06W 35	59.0	0.0	0.00
M:121733	08N 06W 36	59.0	0.0	0.00
M:121732	08N 06W 36	60.0	0.0	0.00



PERRY PARKS, P.A. NO. 22-039

T08N, R06W, SECTION 36

SCALE: 1" = 1000'



DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

PIONEER

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

PERRY PARK PA# 22-039
BASIN DISTRICT JEFFERSON COUNTY

SHEET NO.

22-039.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Bullock, Clark

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
PL-1	OTH	22,000	South side of creek on west end of placer tailings	None	5.4 (D)	0.05	N/A	N/A	XRF Analysis
PL-2	OTH		North side of gulch	None	NC	0.04	N/A	N/A	XRF Analysis

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: Placer tailings; NC = Not Collected.

MDSL AMRB/PIONEER 4/9/93

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map o topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:____________

Filled shafts: Yes___, No X , Number:____ Identification:____________

Seeps/Springs: Yes X , No___, Number: 2 Identification: In placer diggings

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 17

Distance to nearest well used for drinking? 3 miles

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely X .
Not sure source exists.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No ___, Name(s): Grub Gulch

Dry streambeds: Yes ____, No X , Name(s): ____

Other surface water: Yes ____, No X , Name(s)/Description: ____

Waste materials within any floodplain: Yes X , No ___ Source ID(s): Placer diggings in Grub Gulch.

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 25 gpm during sampling
High Flow: 75 gpm , Average Flow: 15 gpm

Distance between waste source(s) and nearest surface water body (ft)?
0 feet

Surface water draining onto or through waste sources: Yes X , No ____,
Describe: Some seeps are in placer diggings.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery, wetland, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes X ,
No _____, Distance downstream (ft)? 500 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Sedimentation from runoff on logging roads.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Bullock

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Grub Gulch below placer diggings approx. 300′ above crossing with road	6.56	98	248	7.7	18	25 gpm (E)	N/A	N/A	N/A
SE-1	SE	Grub Gulch below placer diggings approx. 300′ above crossing with road	N/A	N/A	N/A	N/A	N/A	N/A	22-039-SE-1	07/09/93 1700	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? N/A

Wetlands present: Yes___, No___, Describe: N/A

Carbonate rocks/soils: Yes___, No___, Describe: N/A

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 3 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Bullock, Clark

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
PL	None	Partial	118,980	118,980	No	None

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:________________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments_None_

Evidence of recreational use on site: Yes___, No_X_, Describe:_______

Accessibility - Fences, warning signs, closed roads?_Unrestricted_

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes___, No_X_, Comment__________
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage_X_; Secondary Drainage___; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium___, Low_X_
Fisheries Habitat and Species Classification - _Not Rated_
Sport Fishery Classification - _Not Rated_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:___

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:____________________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:____________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:_______________

Bibliography

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Perry Park site, Prepared by Northern Engineering and Testing, July 29, 1988.

USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

PERRY PARK
PA NO. 22-039

Perry's Park PA# 22−039
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER − BABITS
INVESTIGATION DATE: 07/09/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22−039−SE−1	15 J	27.1	0.5 U	4.7	3.6	6.8	10000	0.028 J	428	4	8 J	4 U	66	NR
BACKGROUND	88	76	0.7 U	9.5	10.9 J	49.7 J	20400	0.107 J	654 J	9	117 JX	8 UJ	104	NR

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

LEGEND

SE1 − Grub Gulch below placer diggings approx. 300' above crossing.
BACKGROUND − From the Enterprise (22−074−SS−1).

XRF ANALYSIS RESULTS

PERRY PARK
PA NO. 22-039

Mine Name: Perry Parks PA# 22-039
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-039-PL-1		36139.7	4940.02	1660.85			23494.3			109.336 *		228.542
22-039-PL-2		31947.6	4081.14	1084.72		349.513 *	28397.2			112.637 *	73.8685 *	212.645
22-039-SE-1		36139.7	4940.02	1660.85		256.05	23494.3		17.8823	109.336	11.2755	228.542
22-039-SE-1		8366	3165.75	792.943		907.402	9686.15			73.807 *	25.8722 *	283.003

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-039-PL-1	172.88				315.663			614.982		21.5034 *	23.1488 *
22-039-PL-2	144.7	48.0603 *		24.158 *	272.418			720.51		21.3155 *	21.7984 *
22-039-SE-1	172.88	28.6398			315.663	114.877		614.982	61.4384	21.5034	23.1488
22-039-SE-1	100.281	27.8533 *			151.35			669.644			12.9609 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

PERRY PARK
PA NO. 22-039

AIMSS SCORESHEET

SITE NAME: PERRY PARK
PA NUMBER: 22-039

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.006
6	GW - TARGETS	WELLS - 1 MI. x 2.5		17.5
7		WELLS - 1 TO 4 MI		10
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	27.5
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	33
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.062
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		0
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	446
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		1
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	5
27		LIKELIHOOD SCORE	LINES 25 + 26C	5
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.006
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	10
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	0
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.001
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE**	(LINES 10 + 24 + 35 + 44) / 100,000		**0.00**

SITE NAME: PERRY PARK
PA NUMBER: 22-039

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

22-039, #33: Overview of site

22-039, #34: Overview of site

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: BUCKEYE PA#: 22-072

Date: July 6, 1993 Time: 0900

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; cool (40°-50°); slight breeze (< 5 mph); cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #2: WR-1 and loadout; #3: Mill building; #7: SW-3 and SE-3 sample locations with tailings. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Tailings contain elevated As and Pb and should be removed from the floodplain and reprocessed. Waste rock could be recontoured and revegetated with lime and coversoil.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BUCKEYE PA#: 22-072

Legal Description: T 8N ;R 6W ;Sec. 36 , NW1/4 SE1/4 ___1/4

County: JEFFERSON Mining District: BASIN

Latitude: N 46° 23' 52" Longitude: W 112° 17' 38"

Primary Drainage Basin and Code: Basin Creek/10020006
Secondary Drainage Basin: Basin Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Beverly Woody and Thomas Kelly, 4810 South Arizona, Butte, MT 59701; Deerlodge National Forest.

Relationship to other mines/sites in the area/district:
Immediately adjacent to Enterprise site.

Regulatory Status (Activity by other agencies)? Hardrock permits?
Past Reclamation Activities? N/A

General site features: Elevation 7000' , Slope 10° ,
Aspect South and West

Land use: Mining___, Recreational___, Residential___, Urban___,
Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? 9 acres.
Dimensions:

Predominant vegetation types: Fir, grasses

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). The site is underlain by quartz monzonite of the Boulder Batholith. Site is at the headwaters of Basin Creek. Groundwater is approx. 6 inches deep (piezometer on-site).

Mining/milling history, ore type/tenor, host rock, gangue: Patented in 1875, worked until 1908 and some in 1940's; mill (gravity) then floatation in 1940's. Production from 1902 to 1949 inclusive was 1,813 tons of ore that yielded 309 oz. Au, 18,227 oz. Ag, 3,425 lbs. Cu, 76,590 lbs. Pb, and 13,797 lbs. Zn. Small additional production under the name Boston. Vein with quartz gangue carrying gold bearing pyrite and silver bearing galena.

Mine Operation?

Shafts - Yes___, No X, # ___, Comment
Adits - Yes X, No___, # 3, Comment All very collapsed
Pits - Yes___, No X, # ___, Comment
Placers - Yes___, No X, # ___, Comment
Other - Yes___, No X, # ___, Comment

Mill Operation? Yes X, No___. If yes answer the next three questions:

Period(s) of Operation: 1875-1908; short period in 1940's

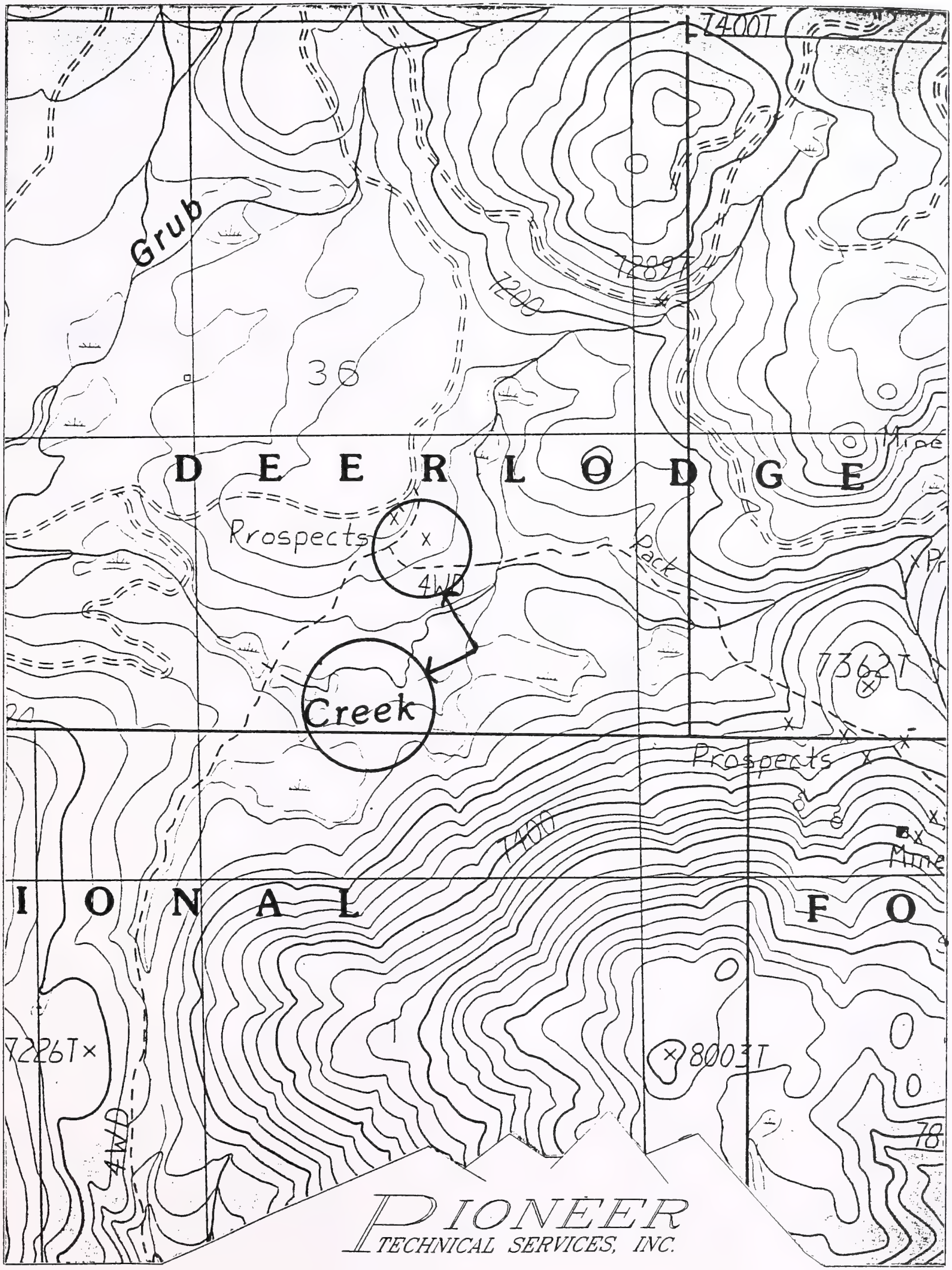
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Gravity (1875-1908); floatation (1940's)

Montana Bureau of Mines and Geology
Water Well Log Data

11/03/1993

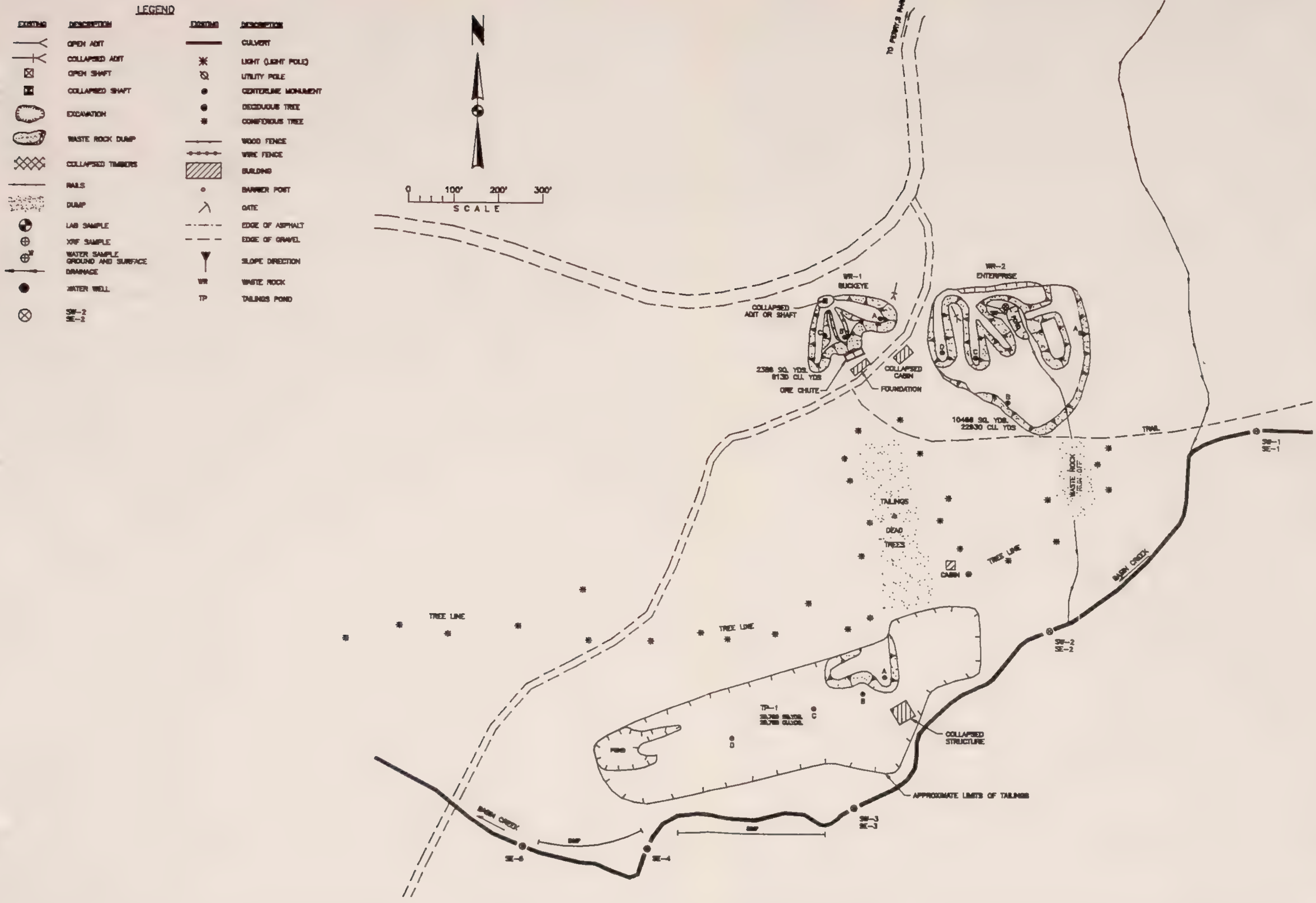
ll No.	Location	Depth	Yield	Static Water Level
M:55788	07N 04W 06 B	105.0	5.0	6.00
M:55789	07N 04W 06 B	165.0	4.0	4.00



PIONEER TECHNICAL SERVICES, INC.

BUCKEYE, P.A. NO. 22-072

T08N, R06W, SECTION 36
SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

BUCKEYE & ENTERPRISE PA# 22-072 & 074
BASIN DISTRICT JEFFERSON COUNTY

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

TD&H
THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

SHEET NO.

22-072.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): From coarse sand to fine clay

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Deepest location is 4 feet.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Partial moisture to saturation

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment can be seen; tailings simply dissipated 1400' downgradient.

Comments on potential for mitigation: Remove

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	6,130	East side on waste rock, north of tailings	None	6.2 (D)	0.04	22-072-WR-1	07/06/93 1520	T-Metals, ABA
WR-1B	WR		Middle on waste rock, north of tailings	None	< 3.5 (D)	0.08			
WR-1C	WR		West on waste rock, north of tailings	None	6.2 (D)	0.05			
TP-1A-A	TAIL	20,750	Northeast part of pond across from collapsed structure; 0-2', off-white	None	< 3.5 (D)	0.04	22-072-TP-1	07/06/93 1620	T-Metals, ABA, CN-
TP-1A-B	TAIL		Northeast part of pond across from collapsed structure; 2-4', gray	None	< 3.5 (D)	0.04			
TP-1B-A	TAIL		East middle part of pond in front of collapsed structure; 0-2', black with pyrite	None	< 3.5 (D)	0.04			
TP-1B-B	TAIL		East middle part of pond in front of collapsed structure; 2-4', white/gray clay	None	< 3.5 (D)	0.04	22-072-TP-2	07/06/93 1640	T-Metals, ABA, CN-
TP-1B-C	TAIL		East middle part of pond in front of collapsed structure; 4+', underlying soil	None	< 3.5 (D)	0.04			
TP-1C-A	TAIL		Center of pond, 2/3 way downstream; 0-2.5', white clay	None	3.5 (D)	0.05	22-072-TP-3	07/06/93 1650	T-Metals, ABA, CN-
TP-1C-B	TAIL		Center of pond, 2/3 way downstream; 2.5+', underlying soil	None	3.5 (D)	0.05			
TP-1D-A	TAIL		West middle of pond; unknown depth	None	4.2 (D)	0.04			
TP-1D-B	TAIL		West middle of pond; unknown depth	None	4.2 (D)	0.04			
TP-E	TAIL		Surface grab in trees; 0-6"	None	6.2 (D)	0.05	22-072-TP-4	07/06/93 1700	T-Metals, ABA, CN-

* D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-072-WR-1 is composite of WR-1A, -1B, and -1C. 22-072-TP-1 is composite of TP-1A-A, -1A-B, and TP-1B-A. 22-072-TP-2 is composite of TP-1B-B, -1B-C, TP-1C-B, and TP-1D-B. 22-072-TP-3 is composite of TP-1C-A and TP-1D-A. 22-072-TP-4 is TP-E. See Enterprise (22-074) for background soil.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:____________

Filled shafts: Yes___, No_X_, Number:____ Identification:____________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_38___

Distance to nearest well used for drinking?_2 miles_____________

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable_X__, Possible____, Unlikely____.
Uncontained sources containing elevated metal values and shallow aquife
in contact with tailings.

Other observations/notes:_N/A_____________

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No ___, Name(s): Basin Creek

Dry streambeds: Yes ____, No X , Name(s):

Other surface water: Yes ____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes X , No ___ Source ID(s): Tailings are in Basin Creek.

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 4.2 during investigation
High Flow: 40 cfs , Average Flow: 4 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes ____, No X ,
Describe:

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Fishery (observed), irrigation, wetland

Observed erosional/sedimentation/stream turbidity problems? Yes X , No _____, Distance downstream (ft)? 12 mi Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Basin Creek appears turbid until confluence with Boulder River; could be spring runoff, could be Pegasus upgradient of Buckeye.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-3	SW	Downgradient of PPE of tailings in Basin Creek	8.77	650	223	11.4	15	4.2 cfs (M)	22-072-SW-3	07/06/93 1230	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-3	SE	Downgradient of PPE of tailings in Basin Creek	N/A	N/A	N/A	N/A	N/A	N/A	22-072-SE-3	07/06/93 1230	T-Metals
SE-500	SE	500 feet downgradient of tailings	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000 feet downgradient of tailings	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SW-2	SW	In Basin Creek downgradient of Enterprise, upgradient of Buckeye	8.21	120	257 .4	9.9	24	4.69 cfs (M)	22-074-SW-2	07/16/93 1320	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	In Basin Creek downgradient of Enterprise, upgradient of Buckeye	N/A	N/A	N/A	N/A	N/A	N/A	22-074-SE-2	07/16/93 1320	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 10 acres

Wetlands present: Yes X **, No** ___ **, Describe:** Only streambank (willows); some (5 acres) on-site (grasses)

Carbonate rocks/soils: Yes ___ **, No** X **, Describe:** ___

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ___; 10-30 X ; 30-100 ___; 100-300 ___; 300-1,000 ___; 1,000-3,000 ___; 3,000-10,000 ___; 10,000 or greater ___; Comments ___

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	SO3; pH	Moist	21,474	19,327	Yes	Moderate
TP-1	SO3; pH	Moist/Wet	186,750	168,075	Yes	Moderate

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments_None______________________________

Evidence of recreational use on site: Yes_X_, No___, Describe:_Off-road vehicles

Accessibility - Fences, warning signs, closed roads?_Unrestricted; except a "No Trespassing" sign

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes___, No_X_, Comment__________
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:___

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:__________________________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:__________________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:__________

Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Sampling and Analysis Plan and Analytical Data for Buckeye Mine, Provided by Ted Duaime, Date Unknown.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Invnetory, Phase II Problem Area Data Sheet, Prepared by Hiel-Pederson, October 1, 1981.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Buckeye, Prepared by Northern Engineering and Testing, July 29, 1988.

USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

BUCKEYE
PA NO. 22-072

Mine Name: Buckeye PA# 22-072
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-072-SE-1000			5564.33	1293.21		494.589 *	26210.8			204.719	464.64	269.843
22-072-SE-500			7729.41	2747.91		692.493 *	30982		62.0765 *	295.862	1043.39	306.274
22-072-SS-1			11467.2	2736.16		1005.31 *	22282.8			121.862 *	165.704	328.385
22-072-TP1A-A	498.888 *	16941.4	2768.25	701.227			13549.9			408.115	11715.3	32.5047
22-072-TP1A-B	591.836 *	11359.9	3005.51	544.687			26271.2		1062.35	4716.38	11747.5	30.1776 *
22-072-TP1B-A			7190.25	3743.59			34263.2		206.577	443.513	13954.8	342.093
22-072-TP1B-B			7665.14	1834.9			11797.1		175.562 *	275.207	307.07	232.459
22-072-TP1B-C			6576.61	483.43 *			12210.6		120.455 *	2806.69	837.43	87.2921
22-072-TP1C-A			8727.69	2268.97			15604.2		65.4142 *	334.862	1488.95	308.529
22-072-TP1C-B			8002.71	1233.89		446.002 *	13164.7		91.8955 *	2356.8	364.049	144.898
22-072-TP1D-A			8669.42	1767.04	149.938 *		14602.4		56.19 *	106.505 *	720.732	396.241
22-072-TP1D-B			7995.44	2492.88			16821.7		73.0535 *	993.054	200.354	206.975
22-072-TP1-E			6947.61	2657.4			31625.4			94.578 *	9937.36	312.826
22-072-TP-1-COMP	247 $	14159 $	3061 $	658 $	146 $		21925 $		1034 $	3121 $	12520 $	48 $
22-072-TP-2-COMP			6591.06	1610.65		304.247 *	14821.8		123.268 *	1753.1	516.661	170.957
22-072-TP-3-COMP			9157.63	3201.55		452.768 *	16386.1		100.891 *	264.107	489.745	309.934
22-072-WR1-A			10139.1	2651.68		5332.51	25945.2		51.8218 *	335.701	93.2415 *	180.137
22-072-WR1-B	291.887 *		1741.52	1552.04			23896.1			341.6	974.057	70.8674
22-072-WR1-C			2173.99	794.407		375.472 *	56873.4			530.936	1835.53	75.4374
22-072-WR-1-COMP			2377.24	1002.09		1814.4	32807.3			453.263	1084.54	68.5727

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-072-SE-1000	128.926			203.897	120.44		46.0554 *	607.799			
22-072-SE-500	262.391			414.691	145.847	138.003 *		466.435	87.6163 *		10.1428 *
22-072-SS-1	210.633			99.8354	125.411			475.457			8.4155 *
22-072-TP1A-A	101.827			6509.92	146.238	139.02 *	2343.07	159.204	139.97 *		24.2948 *
22-072-TP1A-B	57.5687			9339.4	90.8201	221.163 *	3182.87	162.279	123.308 *		
22-072-TP1B-A	188.91			1544.12	132.964	189.129 *	408.055	715.971			11.0495 *
22-072-TP1B-B	197.797			40.2618 *	48.3063			381.688			
22-072-TP1B-C	44.375			173.305				20.0169 *			
22-072-TP1C-A	210.175			177.829	83.8861		55.1751 *	512.445			8.6839 *
22-072-TP1C-B	73.8919		14.8929 *	44.9856 *	78.2889			68.756			12.7706 *
22-072-TP1D-A	108.842			67.345	118.661			685.529			
22-072-TP1D-B	138.161		7.58596 *	103.557	94.0498			271.655			29.1677
22-072-TP1-E	218.18			424.802	169.082		173.797	660.004			9.33406 *
22-072-TP-1-COMP	77 $			7715 $	89 $		2206 $	179 $	173 $	9 $	11 $
22-072-TP-2-COMP	126.835		7.08492 *	144.157	82.3787			174.127			30.6059
22-072-TP-3-COMP	169.73			93.9694	106.008			515.258			15.6013 *
22-072-WR1-A	183.935			145.742	230.163		47.256 *	365.922	87.8743 *		17.6298 *
22-072-WR1-B	156.077			3229.1	336.99	187.553 *	167.068 *	327.186	95.5581 *		
22-072-WR1-C	150.302			3282.46	326.403		184.024 *	299.937			18.8628 *
22-072-WR-1-COMP	131.47			2347.62	248.878		150.091 *	229.558			

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

BUCKEYE
PA NO. 22-072

AIMSS SCORESHEET

SITE NAME: BUCKEYE
PA NUMBER: 22-072

LINE NO.				
		GROUNDWATER PATHWAY		
1		OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A	GW - LIKELIHOOD OF RELEASE	CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	110.228
6		WELLS - 1 MI. x 2.5		5.0
7	GW - TARGETS	WELLS - 1 TO 4 MI		36
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	41.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	1807739
		SURFACE WATER PATHWAY		
11		OBSERVED RELEASE		0
12	SW - LIKELIHOOD OF RELEASE	EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	115.151
16		DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		63
18		WETLANDS		10
19	SW - TARGETS	FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	81
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	3730892
		AIR PATHWAY		
25		OBSERVED RELEASE		0
26A	AIR - LIKELIHOOD OF RELEASE	CONTAINMENT		15
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.801
29		POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31	AIR - TARGETS	WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	20
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	5702
		DIRECT CONTACT PATHWAY		
36		OBSERVED EXPOSURE		50
37A	LIKELIHOOD OF EXPOSURE	ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.639
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	2
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	728
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**55.45**

SITE NAME: BUCKEYE
PA NUMBER: 22-072

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	2
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
TOTAL RECOVERABLE METALS: (ppb)																			
92Q1128	BBUS10M	0	U		5.33	B		243.42			2308			20.24			0	U	
92Q1125	BBUS20L	0	U		0	U		3.11	B		13.17	B		8.36	B		0	U	
92Q1126	BBUS30M	0	U		0	U		51.69			429.78			8.67	B		0	U	
92Q1121	BBUS40L	0	U		0	U		3.72	B		18.13	B		3.02	B		0	U	
92Q1120	BBUS60M	0	U		6.71	B		358.47			3138			36.9			0	U	
92Q1122	BBUS80L	0	U		0	U		0	U		0	U		2.55	B		0	U	
92Q1127	BBUS90M	0	U		0	U		0	U		6.99	B		2.05	B		0	U	
92Q1123	BBUSA0M	0	U		0	U		0	U		0	U		2.48	B		0	U	
92Q1124	BBUSB0L	0	U		0	U		54.55			450.43			9.23	B		0	U	
TOTAL METALS: (ppm)																			
92S311	BBUD10H	2.70	B		2.01	B		309.47			1937.00			7835.00			30.92		
92S312	BBUD20H	0.00	U		1.37	B		49.19	B		86.56			794.20			5.14	B	
92S320	BBUD30L	4.07	B	N	1.23	B	N	398.73		N	1055.62			10979.29			33.56		N
92S321	BBUD40L	0.00	U	N	0.94	B	N	0.00	U	N	0.00	U		5.82	B		0.00	U	N
92S322	BBUD50L	0.00	U	N	0.00	U	N	0.00	U	N	6.92	B		0.00	U		0.00	U	N
92S313	BBUDTRP	0.00	U		0.00	U		0.00	U		13.72	B		0.00	U		0.00	U	

ENTERPRISE AND BUCKEYE MINES

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
DISSOLVED METALS: (ppb)																			
92Q346	BBAS10H	2.79	B		19.40	B		609.00			15020.00			3438.05			0.00	U	
92Q345	BBAS20L	0.00	U		0.00	U		3.69	B		10.69	B		2.36	B		0.00	U	
92Q344	BBAS30H	2.36	B		15.41	B		1879.00			15730.00			235.31			0.72	B	
92Q355	BBAS40L	0.00	U		2.37	U		12.88	B		152.50			20.16			0.00	U	
92Q366	BBAD40L																		
TOTAL METALS: (ppm)																			
92S347	BBAD10H	2.40	B	N	0.00	U	N	238.40		N	117.00			4568.00			58.66		N
92S356	BBAD20H	5.95	B	N	3.86	B	N	149.43		N	259.75			7698.00			28.17		N
92S357	BBAD30H	4.02	B	N	2.82	B	N	95.56		N	137.51			9173.00			22.22		N
92S367	BBAS50L	0.00	U	N	0.00	U	N	0.00	U	N	6.90	B		0.00	U		0.00	U	N

CRYSTAL MINE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
TOTAL RECOVERABLE METALS: (ppb)													
92Q1128	BBUS10M	18.18			16.83	B		7.85			0.07	B	
92Q1125	BBUS20L	0	U		31.65	B		0.54	U		0.08	B	
92Q1126	BBUS30M	2.34	B		18.93	B		1.64	B		0.07	B	
92Q1121	BBUS40L	0	U		16.2	B		0	U		0.08	B	
92Q1120	BBUS60M	26.44			18.06	B		12.66			0.08	B	
92Q1122	BBUS80L	0	U		38.89	B		0	U		0.08	B	
92Q1127	BBUS90M	0	U		41.15	B		0	U		0.08	B	
92Q1123	BBUSA0M	0	U		42.19	B		0	U		0.06	B	
92Q1124	BBUSB0L	2.31	B		19.88	B		1.42	B		0.08	B	
TOTAL METALS: (ppm)													
92S311	BBUD10H	8.90	B		53.66	B		5356.00			2.37		
92S312	BBUD20H	1.30	B		40.94	B		504.37			0.70		
92S320	BBUD30L	8.13	B	N	85.00	B	N	2445.77			1.71		
92S321	BBUD40L	0.51	B	N	0.00	U	N	3.27	B		0.21	B	
92S322	BBUD50L	0.58	B	N	0.00	U	N	0.00	U		0.25	B	
92S313	BBUDTRP	0.51	B		0.00	U		0.00	U		0.23	B	

ENTERPRISE AND BUCKEYE

DISSOLVED METALS: (ppb)													
92Q346	BBAS10H	119.50			22.24	B		1173.66			0.00	U	
92Q345	BBAS20L	0.00	U		12.62	B		0.00	U				
92Q344	BBAS30H	156.82			10.31	B		128.37					
92Q355	BBAS40L	1.54	B		12.59	B		11.20			0.11	B	
92Q366	BBAD40L										0.07	B	
TOTAL METALS: (ppm)													
92S347	BBAD10H	5.43	B	N	140.98	B	N	4029.00			0.68		
92S356	BBAD20H	3.42	B	N	59.93	B	N	5841.00			1.10		
92S357	BBAD30H	1.99	B	N	63.20	B	N	3946.00			0.83		
92S367	BBAS50L	0.00	U	N	0.00	U	N	0.00	U		0.37	B	

CRYSTAL MINE

DISSOLVED METALS: (ppb)

Buckeye PA# 22-072
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BABITS
INVESTIGATION DATE: 07/06/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-074-SE-2	2360	30	1.2	10.5	12.6 J	60.6 J	47100	0.083 J	455 J	9	415 JX	42 J	208 J	NR
22-072-SE-3	997 JX	30.4	0.9	7.2	4.8	44.3	19200	0.056 J	488 J	6	589	74 J	253	NR
22-072-TP-1	17100 JX	29.6	24.9	4	1.4	1160	24400	0.108 J	24.2 J	2 U	14100	2350 J	4040	0.271 U
22-072-TP-2	252 JX	224	3.9	16.2	17	168	16900	0.082 J	237 J	22	281	12 UJ	1250	0.577 U
22-072-TP-3	708 JX	74.4	0.9 U	5.2	7	51.2	6610	0.057 J	61.7 J	5 U	213	19 J	300	0.41 U
22-072-TP-4	7160 JX	66.4	0.4 U	5.6	3.8	17.9	21000	0.03 J	393 J	4	417	76 J	54	0.268 U
22-072-WR-1	628 JX	31	0.5 U	4.1	1.4 U	35	18600	0.342 J	1970 J	5	1850	29 J	340	NR
BACKGROUND	88	76	0.7 U	9.5	10.9 J	49.7 J	20400	0.107 J	654 J	9	117 JX	8 UJ	104	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-072-TP-1	2.45	76.5	-2	-79	0.64	1.54	0.27	48.1	-50.1
22-072-TP-2	0.31	9.68	-0.9	-11	0.11	0.06	0.14	1.87	-2.79
22-072-TP-3DUP	0.09	2.81	1.03	-1.8	0.05	0.02	0.02	0.62	0.4
22-072-TP-3	0.09	2.81	0.82	-2	0.05	0.02	0.02	0.62	0.19
22-072-TP-4	0.04	1.25	-0.8	-2.1	0.04	<0.01	<0.01	0	-0.81
22-072-WR-1	0.87	27.2	8.72	-19	0.58	0.13	0.16	4.06	4.66
22-072-WR-1DUP	0.88	27.5	9.25	-18	0.59	0.13	0.16	4.06	5.19

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-074-SW-2	10.1 J	4.43	2.57 U	9.7 U	6.83 U	6.23 J	167	0.038 U	143	12.7 U	9.67 J	30.7 U	129	23.3
22-072-SW-3	18.1	5.53	2.57 U	9.7 U	9.27 J	15.9 J	284 J	0.038 U	161 JX	12.7 U	14.5 JX	30.7 U	165 J	25.9

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-074-SW-2	80	< 5.0	8	< 0.05	NR
22-072-SW-3	89	< 5.0	8	< 0.05	NR

LEGEND

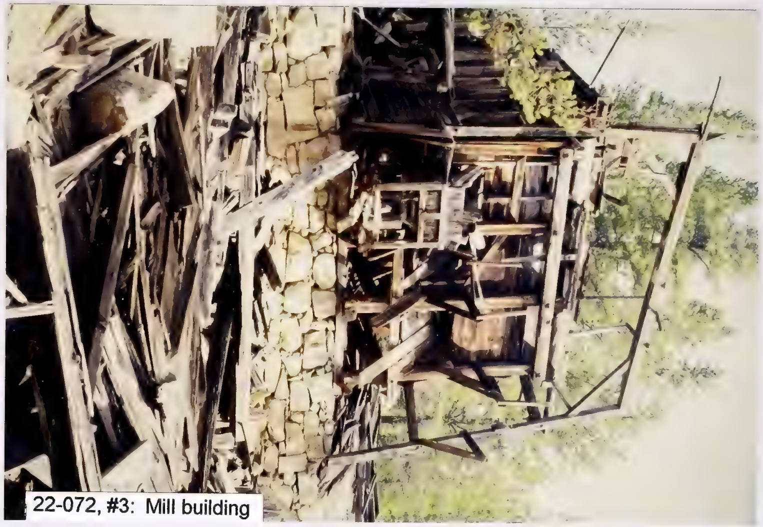
22-074-SE2 - In Basin Creek down oe PPE from Enterprise Mine.
SE3 - Downgradient of PPE of tailings in Basin Creek.
TP1 - Composite of subsamples TP1A-A, 1A-B, and 1B-A.
TP2 - Composite of subsamples TP1B-B, 1B-C, 1C-B, and 1D-B.
TP3 - Composite of subsamples TP1C-A aand 1D-A.
TP4 - Sample of TPE subsample.
BACKGROUND - From the Enterprise Mine (22-074-SS-1).
SW3 - Same as sample SE3.
22-074-SW2 - Same as 22-074-SE2 sample.

XRF ANALYSIS RESULTS

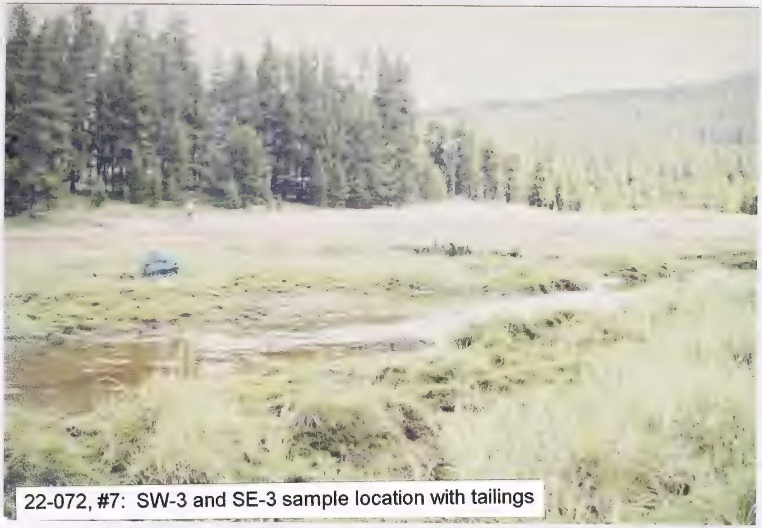
BUCKEYE
PA NO. 22-072

MDSL AMRB/PIONEER 4/9/93

22-072, #2: WR-1 and loadout



22-072, #3: Mill building



22-072, #7: SW-3 and SE-3 sample location with tailings

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: ENTERPRISE **PA#:** 22-074

Date: July 6, 1993 **Time:** 1055

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; cool (40°-50°); slight breeze (< 5 mph); cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #4: East side of WR-2; #5: West side of WR-2; #6: Adit discharge through WR-2. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Adit discharge has low pH and significant metals concentrations and should be treated. Waste rock has low pH and elevated metals and it may be possible to recontour, coversoil, amend, and revegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ENTERPRISE PA#: 22-074

Legal Description: T 8N ;R 6W ;Sec. 36 , NW1/4 SE1/4 ___1/4

County: JEFFERSON Mining District: BASIN

Latitude: N 46° 23' 52" Longitude: W 112° 17' 38"

Primary Drainage Basin and Code: Basin Creek/10020006
Secondary Drainage Basin: Basin Creek

USGS Quadrangle map name(s): Three Brothers

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active___, Inactive/Exploration___, Abandoned X .

Ownership status: Known YX N__; private/public? Public
Owner, Agent, or Contact(Include address and phone when available): Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Immediately (80') east of Buckeye mine site. Appears to have been worked with Buckeye as a single operation.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7000' , Slope 10° , Aspect South

Land use: Mining___, Recreational___, Residential___, Urban___, Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? Approx. 1 acres.
Dimensions:

Predominant vegetation types: Fir, grasses

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 2 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). The site is underlain by quartz monzonite in Boulder Batholith. Site lies at the headwaters of Basin Creek. Groundwater is shallow (1 foot deep).

Mining/milling history, ore type/tenor, host rock, gangue: Gangue is quartz with galena, sphalerite and pyrite. No other information available.

Mine Operation?
Shafts - Yes___, No_X_, #____, Comment________
Adits - Yes_X_, No___, #_1_, Comment_Collapsed
Pits - Yes___, No_X_, #____, Comment________
Placers - Yes___, No_X_, #____, Comment________
Other - Yes___, No_X_, #____, Comment________

Mill Operation? Yes____, No_X_. If yes answer the next three questions:

Period(s) of Operation: N/A

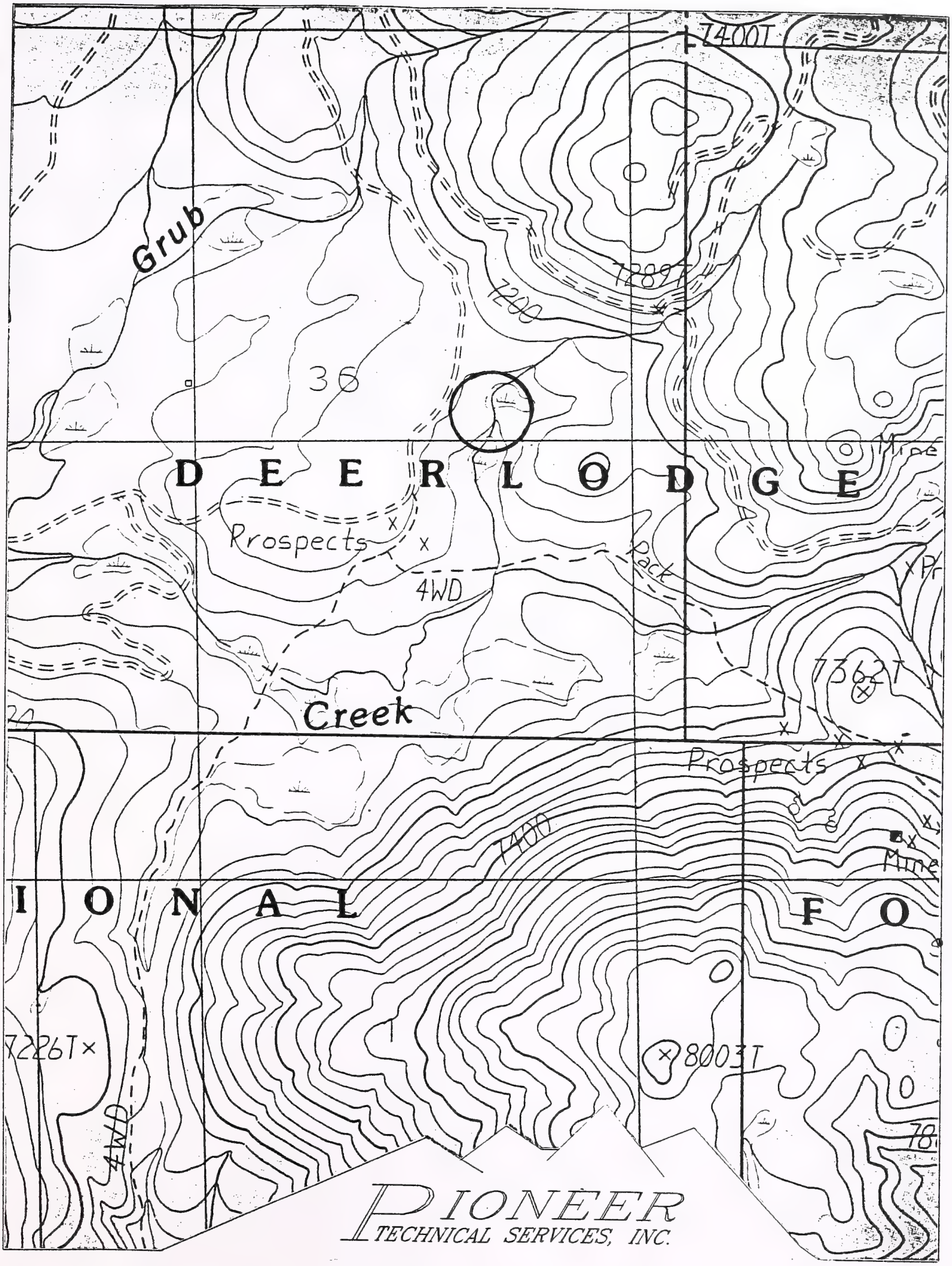
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

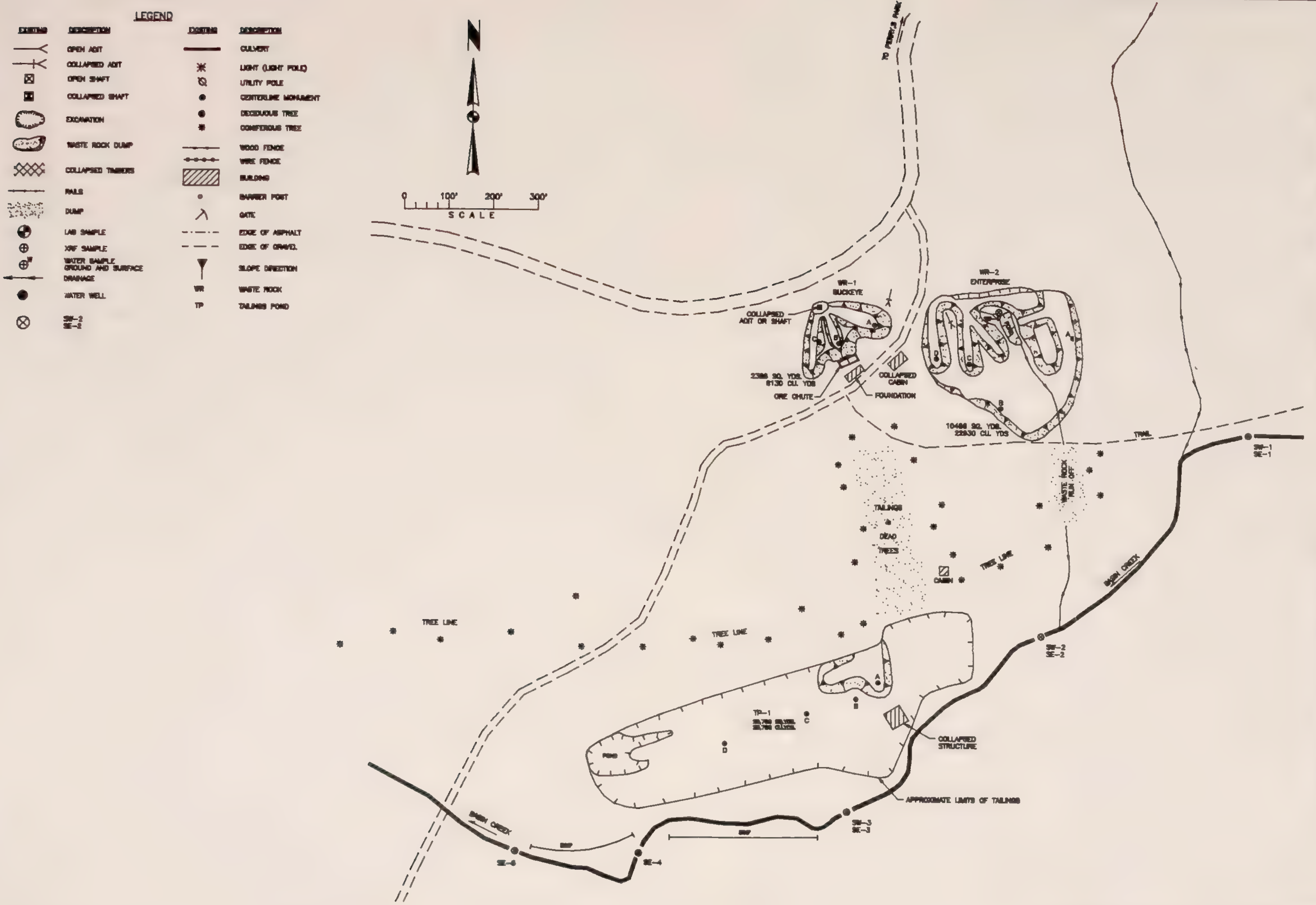
11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M:55788	07N 04W 06 B	105.0	5.0	6.00
M:55789	07N 04W 06 B	165.0	4.0	4.00



PIONEER
TECHNICAL SERVICES, INC.

ENTERPRISE, P.A. NO. 22-074
T08N, R05W, SECTION 36
SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

BUCKEYE & ENTERPRISE PA# 22-072 & 074
BASIN DISTRICT JEFFERSON COUNTY

PIONEER

DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

TDH

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

SHEET NO.

22-072.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-2A	WR	22,930	East side of WR-2	None	5.8 (D)	0.05	22-074-WR-1	07/06/93 1530	T-Metals, ABA
WR-2B	WR		Southwest edge of WR-2	None	5.6 (D)	0.06	22-074-WR-2	07/06/93 1545	T-Metals, ABA
WR-2C	WR		On top of second lobe in from west	None	< 3.5 (D)	0.05			
WR-2D	WR		West lobe on top	None	< 3.5 (D)	0.06			
SS-1	BKGRND	N/A	Background soil 300 feet upgradient from SW-1	N/A	6.8 (D)	0.04	22-074-SS-1	07/06/93 1600	T-Metals

* D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-074-WR-1 is composite of WR-2A and -2D. 22-074-WR-2 is composite of WR-2B and -2C.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No ___, Number: 1 Identification: In WR-2, but sampled as SW because adit collapsed and had to collect as flowing
Filled shafts: Yes ___, No X, Number: ___ Identification: ___

Seeps/Springs: Yes ___, No X, Number: ___ Identification: ___

Groundwater wells within 4 miles?: Yes X, No ___;
Number of well logs: 38

Distance to nearest well used for drinking? 2 miles

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite ___, Probable X, Possible ___, Unlikely ___.
Uncontained sources with elevated metal values and shallow groundwater

Other observations/notes: N/A

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Basin Creek

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes X, No ___, Name(s)/Description: An unnamed tributary enters Basin Creek just above site; pH is 8.41, flow is 1.3 cfs.

Waste materials within any floodplain: Yes X, No ___ Source ID(s): Waste rock is in floodplain.

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? 4.2 during investigation
High Flow: 40 cfs, **Average Flow:** 4 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet between surface water and dump.

Surface water draining onto or through waste sources: Yes ___, No X, Describe: ___

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Irrigation, wetland, fishery, agriculture

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___, **Distance downstream (ft)?** 12 mi **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Basin Creek turbid until Boulder River; spring runoff

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-4	AD	Adit discharge	< 1 gpm (E)	2.9	1980	431	15	0	N/A	22-074-SW-4	07/06/93 1345	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Upgradient in Basin 100 feet above confluence with unnamed tributary	8.97	260	319	8.2	23	4.2 cfs (M)	22-074-SW-1	07/06/93 1405	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Upgradient in Basin 100 feet above confluence with unnamed tributary	N/A	N/A	N/A	N/A	N/A	N/A	22-074-SE-1	07/06/93 1405	T-Metals
SW-2	SW	In Basin Creek down of PPE of adit discharge	8.21	120	257.4	9.9	24	4.2 cfs (M)	22-074-SW-2	07/06/93 1320	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	In Basin Creek down of PPE of adit discharge	N/A	N/A	N/A	N/A	N/A	N/A	22-074-SE-2	07/06/93 1320	T-Metals
SE-500	SE	500 feet below SE-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000 feet below SE-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 2 to 3 acres

Wetlands present: Yes X, No ___, Describe: Grasses, hydric soil, no cattails

Carbonate rocks/soils: Yes ___, No X, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ___; 10-30 X; 30-100 ___; 100-300 ___; 300-1,000 ___; 1,000-3,000 ___; 3,000-10,000 ___; 10,000 or greater ___; Comments

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	**ACID MINE DRAINAGE CHARACTERISTICS** (LIST)	**MOISTURE CONTENT** (WET/DRY/PARTIAL)	**SURFACE AREA** (SQUARE FEET)	**UNCOVERED/UNVEGETATED AREA** (SQUARE FEET)	**AVAILABLE FINES** (YES/NO)	**DUST PROPAGATION POTENTIAL** (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-2	SO3; pH	Wet	94,374	94,374	Yes	Moderate
SW-4	pH	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications: ______________________

MDSL AMRB/PIONEER 4/9/93

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:____________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments_None____________________

Evidence of recreational use on site: Yes_X_, No___, Describe:_Off-road vehicle tracks (bikes)____________________

Accessibility - Fences, warning signs, closed roads?_Unrestricted; one "No Trespassing" sign____________________

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes___, No_X_, Comment__________
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:___
____
____

Hazardous structures: Yes___, No_X_, Number____, types and locations:_
____
____

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:____________________
____

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:____________________
____
____

Fire and/or Explosion hazards: Yes___, No_X_, Explain:__________
____

Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Sampling and Analysis Plan and Analytical Data for Enterprise Mine, Provided by Ted Duaime, Date Unknown.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

USGS, Topographic Map, Three Brothers, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

ENTERPRISE
PA NO. 22-074

Enterprise PA# 22-074
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER -- BABITS
INVESTIGATION DATE: 07/06/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-074-SE-1	15	29.2	0.6 U	8.1	5.7 J	12.9 J	15400	0.031 J	412 J	6	34 JX	7 UJ	95 JX	NR
22-074-SE-2	2360	30	1.2	10.5	12.6 J	60.6 J	47100	0.083 J	455 J	9	415 JX	42 J	208 JX	NR
22-074-WR-1	5840	81.5	0.9	2.2 U	2.3 J	62.4 J	37000	0.068 J	131 J	3 U	1000 JX	91 J	133 JX	NR
22-074-WR-2	22400	24.4	1.4	2.1 U	1.4 UJ	94.6 J	33100	0.209 J	20.8 J	3 U	3520 JX	291 J	78 JX	NR
BACKGROUND	88	76	0.7 U	9.5	10.9 J	49.7 J	20400	0.107 J	654 J	9	117 JX	8 UJ	104 JX	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-074-WR-1	0.38	11.9	-3.1	-15	0.36	<0.01	0.03	0	-3.1
22-074-WR-2	2.97	92.8	-4.8	-97.	0.63	1.76	0.58	55	-59.8

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-074-SW-1	3.71 J	4.27	2.57 U	9.7 U	6.83 U	2.43 J	99.7	0.130 J	13.3	12.7 U	5.42 J	30.7 U	12.9	23
22-074-SW-2	10.1 J	4.43	2.57 U	9.7 U	6.83 U	6.23 J	167	0.038 U	143	12.7 U	9.67 J	30.7 U	129	23.3
22-074-SW-4	15500 J	13.9	146	42	6.83 U	1340 J	131000	0.081 J	28900	31.7	1340 J	84.2	23400	192

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-074-SW-1	43	< 5.0	< 5	< 0.05	NR
22-074-SW-2	80	< 5.0	8	< 0.05	NR
22-074-SW-4	1050	< 5.0	622	< 0.05	NR

LEGEND

SE1 – Upgradient in Basin 100' above confluence with unnamed tributary.
SE2 – In Basin Creek down of PPE of adit discahrge.
WR1 – Composite of subsamples WR2A and 2D.
WR2 – Composite of subsamples WR2B and 2C.
BACKGROUND – 300' upgradient from SW1. From Enterprise (22-074-SS-1).

SW1 – Same as sample SE1.
SW2 – Same as sample SE2.
SW4 – Adit discharge.

XRF ANALYSIS RESULTS

ENTERPRISE
PA NO. 22-074

MDSL AMRB/PIONEER 4/9/93

Mine Name: Enterprise PA# 22-074
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-074-SE-1000		9978.5	5564.33	1293.21		494.589 *	26210.8			204.719	464.64	269.843
22-074-SE-500		14730.8	7729.41	2747.91		692.493 *	30982		62.0765 *	295.862	1043.39	306.274
22-074-SS-1		14814.9	11467.2	2736.16		1005.31 *	22282.8			121.862 *	165.704	328.385
22-074-WR2-A		31672.9	2601.08	1913.77			49381.5		53.7481 *	338.57	4696.89	173.765
22-074-WR2-B		15093.3	2899.41	1715.25			60223.4		70.1264 *	258.359	14053.7	227.441
22-074-WR2-C		23052.6	2024.12	560.912			93117.8		235.434	256.764	96728.8	65.4616
22-074-WR2-D		42848.1	1405.61	1382.04			25356.4			157.591	1424.83	87.128
22-074-WR-1-COMP		32420.8	2551.97	1696.12			53831.3		60.8407 *	225.956	9174.32	159.948
22-074-WR-2-COMP		36752.4	1778.11	1003.36			65502.9		150.397 *	161.232 *	49851.4	100.925

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-074-SE-1000	128.926			203.897	120.44		46.0554 *	607.799		15.1273 *	
22-074-SE-500	262.391			414.691	145.847	138.003 *		466.435	87.6163 *		10.1428 *
22-074-SS-1	210.633			99.8354	125.411			475.457			8.4155 *
22-074-WR2-A	163.875			1434.29	231.432	194.038 *	291.999	693.62	91.0874 *	13.1239 *	
22-074-WR2-B	200.157			738.858	146.758	198.939 *	157.857 *	659.214		13.272 *	
22-074-WR2-C	85.2627			3191.22	215.26		1649.38	386.91	170.293 *	9.85072 *	
22-074-WR2-D	154.638			2136.55	296.126	123.289 *	371.517	490.08	90.2144 *	19.5701 *	
22-074-WR-1-COMP	201.216			1409.83	250.928	155.41 *	170.198 *	719.597			
22-074-WR-2-COMP	122.467			2906.65	290.64	270.189 *	1052.25	506.98	158.289 *		

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

ENTERPRISE
PA NO. 22-074

AIMSS SCORESHEET

SITE NAME: ENTERPRISE
PA NUMBER: 22-074

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	332.270
6	GW - TARGETS	WELLS - 1 MI. x 2.5		5.0
7		WELLS - 1 TO 4 MI		36
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	41.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	5449228
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	337.238
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		63
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	81
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	19121395
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		15
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.320
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	20
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	4980
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		10
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	50
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.272
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	2
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	654
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**245.76**

			SITE NAME:	ENTERPRISE
LINE NO.		**SITE SAFETY**	PA NUMBER:	22-074
1	THREAT	ACCESSIBILITY		10
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	2
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
TOTAL RECOVERABLE METALS: (ppb)																			
92Q1128	BBUS10M	0	U		5.33	B		243.42			2308			20.24			0	U	
92Q1125	BBUS20L	0	U		0	U		3.11	B		13.17	B		8.36	B		0	U	
92Q1126	BBUS30M	0	U		0	U		51.69			429.78			8.67	B		0	U	
92Q1121	BBUS40L	0	U		0	U		3.72	B		18.13	B		3.02	B		0	U	
92Q1120	BBUS60M	0	U		6.71	B		358.47			3138			36.9			0	U	
92Q1122	BBUS80L	0	U		0	U		0	U		0	U		2.55	B		0	U	
92Q1127	BBUS90M	0	U		0	U		0	U		6.99	B		2.05	B		0	U	
92Q1123	BBUSA0M	0	U		0	U		0	U		0	U		2.48	B		0	U	
92Q1124	BBUSB0L	0	U		0	U		54.55			450.43			9.23	B		0	U	
TOTAL METALS: (ppm)																			
92S311	BBUD10H	2.70	B		2.01	B		309.47			1937.00			7835.00			30.92		
92S312	BBUD20H	0.00	U		1.37	B		49.19	B		86.56			794.20			5.14	B	
92S320	BBUD30L	4.07	B	N	1.23	B	N	398.73		N	1055.62			10979.29			33.56		N
92S321	BBUD40L	0.00	U	N	0.94	B	N	0.00	U	N	0.00	U		5.82	B		0.00	U	N
92S322	BBUD50L	0.00	U	N	0.00	U	N	0.00	U	N	6.92	B		0.00	U		0.00	U	N
92S313	BBUDTRP	0.00	U		0.00	U		0.00	U		13.72	B		0.00	U		0.00	U	

ENTERPRISE AND BUCKEYE MINES

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
DISSOLVED METALS: (ppb)																			
92Q346	BBAS10H	2.79	B		19.40	B		609.00			15020.00			3438.05			0.00	U	
92Q345	BBAS20L	0.00	U		0.00	U		3.69	B		10.69	B		2.36	B		0.00	U	
92Q344	BBAS30H	2.36	B		15.41	B		1879.00			15730.00			235.31			0.72	B	
92Q355	BBAS40L	0.00	U		2.37	U		12.88	B		152.50			20.16			0.00	U	
92Q366	BBAD40L																		
TOTAL METALS: (ppm)																			
92S347	BBAD10H	2.40	B	N	0.00	U	N	238.40		N	117.00			4568.00			58.66		N
92S356	BBAD20H	5.95	B	N	3.86	B	N	149.43		N	259.75			7698.00			28.17		N
92S357	BBAD30H	4.02	B	N	2.82	B	N	95.56		N	137.51			9173.00			22.22		N
92S367	BBAS50L	0.00	U	N	0.00	U	N	0.00	U	N	6.90	B		0.00	U		0.00	U	N

CRYSTAL MINE

DISSOLVED METALS: (ppb)

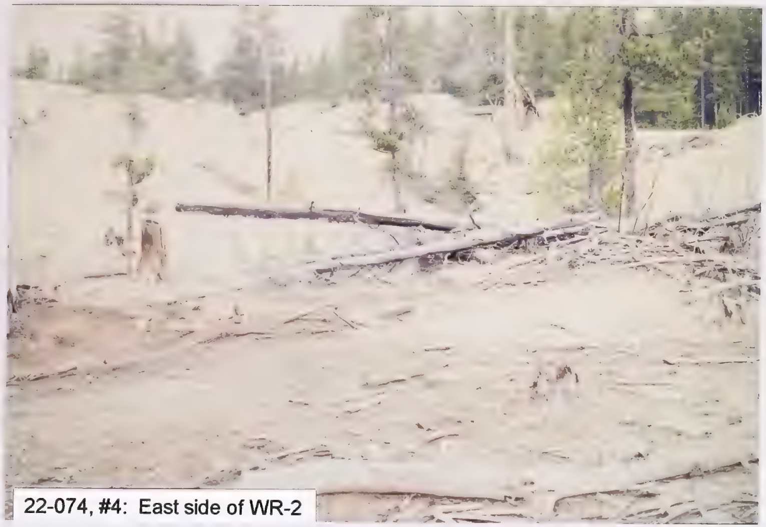
LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
TOTAL RECOVERABLE METALS: (ppb)													
92Q1128	BBUS10M	18.18			16.83	B		7.85			0.07	B	
92Q1125	BBUS20L	0	U		31.65	B		0.54	U		0.08	B	
92Q1126	BBUS30M	2.34	B		18.93	B		1.64	B		0.07	B	
92Q1121	BBUS40L	0	U		16.2	B		0	U		0.08	B	
92Q1120	BBUS60M	26.44			18.06	B		12.66			0.08	B	
92Q1122	BBUS80L	0	U		38.89	B		0	U		0.08	B	
92Q1127	BBUS90M	0	U		41.15	B		0	U		0.08	B	
92Q1123	BBUSA0M	0	U		42.19	B		0	U		0.06	B	
92Q1124	BBUSB0L	2.31	B		19.88	B		1.42	B		0.08	B	
TOTAL METALS: (ppm)													
92S311	BBUD10H	8.90	B		53.66	B		5356.00			2.37		
92S312	BBUD20H	1.30	B		40.94	B		504.37			0.70		
92S320	BBUD30L	8.13	B	N	85.00	B	N	2445.77			1.71		
92S321	BBUD40L	0.51	B	N	0.00	U	N	3.27	B		0.21	B	
92S322	BBUD50L	0.58	B	N	0.00	U	N	0.00	U		0.25	B	
92S313	BBUDTRP	0.51	B		0.00	U		0.00	U		0.23	B	

ENTERPRISE AND BUCKEYE

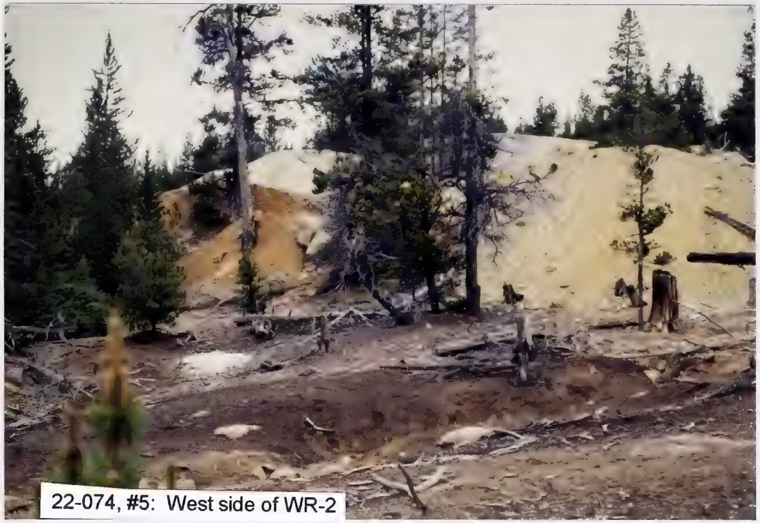
LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
DISSOLVED METALS: (ppb)													
92Q346	BBAS10H	119.50			22.24	B		1173.66			0.00	U	
92Q345	BBAS20L	0.00	U		12.62	B		0.00	U				
92Q344	BBAS30H	156.82			10.31	B		128.37					
92Q355	BBAS40L	1.54	B		12.59	B		11.20			0.11	B	
92Q366	BBAD40L										0.07	B	
TOTAL METALS: (ppm)													
92S347	BBAD10H	5.43	B	N	140.98	B	N	4029.00			0.68		
92S356	BBAD20H	3.42	B	N	59.93	B	N	5841.00			1.10		
92S357	BBAD30H	1.99	B	N	63.20	B	N	3946.00			0.83		
92S367	BBAS50L	0.00	U	N	0.00	U	N	0.00	U		0.37	B	

CRYSTAL MINE

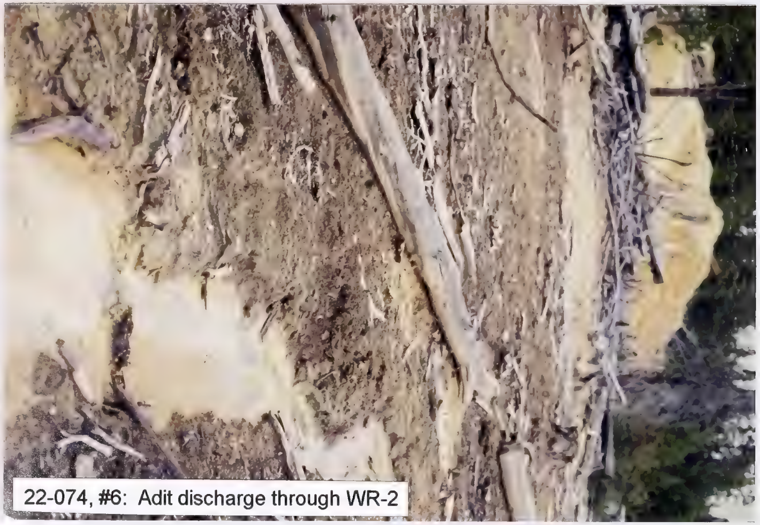
DISSOLVED METALS: (ppb)



22-074, #4: East side of WR-2



22-074, #5: West side of WR-2



22-074, #6: Adit discharge through WR-2

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: JACK CREEK TAILINGS **PA#:** 22-296

Date: July 6, 1993 **Time:** 1700-2000

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Partly cloudy; warm; calm; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #15: TP-1B, facing south; #16: TP-1A, facing northwest; #17: SW-2 sample location, facing northwest; #18: Tailings pond, facing northwest; #19: TP-1C, facing west; #20: TP-1D, facing east; #21: SW-1 sample location, facing northwest; #22: WR-1, facing south. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site was by truck.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Remove tailings from active stream channel. Amend and revegetate tailings. Stabilize stream channel; may require study.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): JACK CREEK TAILINGS **PA#:** 22-296

Legal Description: T 7N ;R 6W ;Sec. 14 ,SW 1/4 NE1/4 ___1/4

County: JEFFERSON **Mining District:** BASIN

Latitude: N 46° 21' 42" **Longitude:** W 112° 18' 27"

Primary Drainage Basin and Code: Basin Creek/10020006
Secondary Drainage Basin: Jack Creek
USGS Quadrangle map name(s): Basin

Mine Type/Commodities: Tailings
Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): David Rodems, Box 69, Jefferson City, MT 59638. (406) 933-8566; Arto W. Swingle, Trustee, 7 Collamer Circle, Shelburne, VT 05482. (802) 985-2167; Rafael and Victoria Salmon, 236 La Alameda, San Pedro, CA 90731; Forrest Klies, c/o Leon and Bonnie Dolence, 2188 North Crow Road, Ronan, MT 59864. (406) 676-5043; Anthony Walsher, Box 147, Park River, ND 58270. (701) 284-7481; Forrest Klies, c/o Laurence and Lucille Young, 1522 Hillcrest Drive, Polson, MT 59860-7207. (406) 883-2028; John Fenske, PSC #1 Box 321, Lackland AFB, TX 78236-5001. (208) 921-2680; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Source of tailings was not determined.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 6500' , Slope 0°-10° , Aspect Southwest

Land use: Mining___, Recreational X , Residential___, Urban___, Agricultural___, Other(Specify)___

Area of disturbed/unvegetated lands? 3.5 acres.
Dimensions: 1,200 feet x 130 feet

Predominant vegetation types: Lodgepole pine

Access: roads - good___,poor X ,4wd___,trail___.
Other logistical considerations (proximity to other sites).___

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies in drainage of the perennial Jack Creek, which flows into Basin Creek.

Mining/milling history, ore type/tenor, host rock, gangue: No information available.

Mine Operation?
Shafts - Yes___, No X, # ___, Comment
Adits - Yes___, No X, # ___, Comment
Pits - Yes___, No X, # ___, Comment
Placers - Yes___, No X, # ___, Comment
Other - Yes___, No X, # ___, Comment

Mill Operation? Yes X, No___. If yes answer the next three questions:

Period(s) of Operation: Unknown

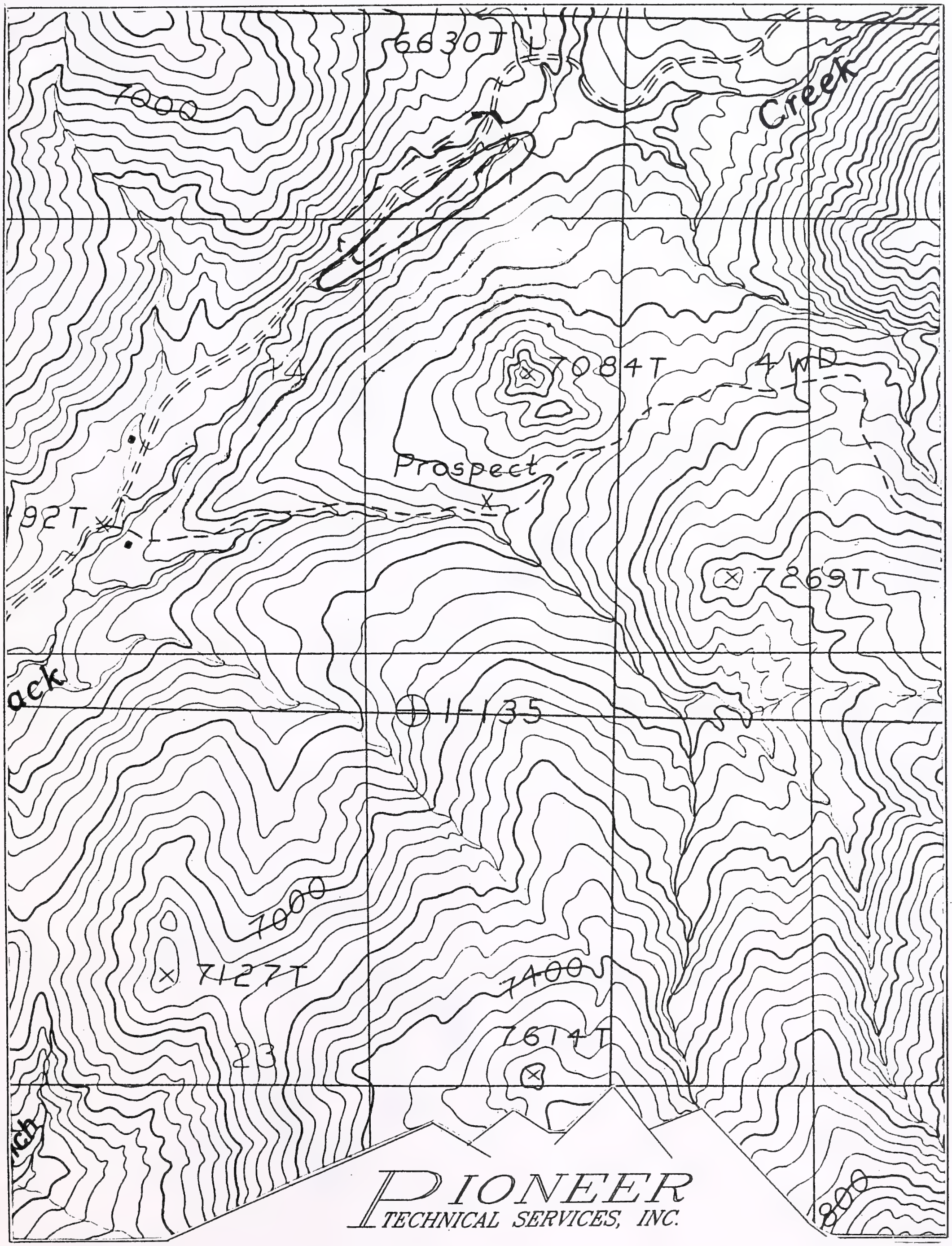
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
Unknown

Montana Bureau of Mines and Geology
Water Well Log Data

11/03/1993

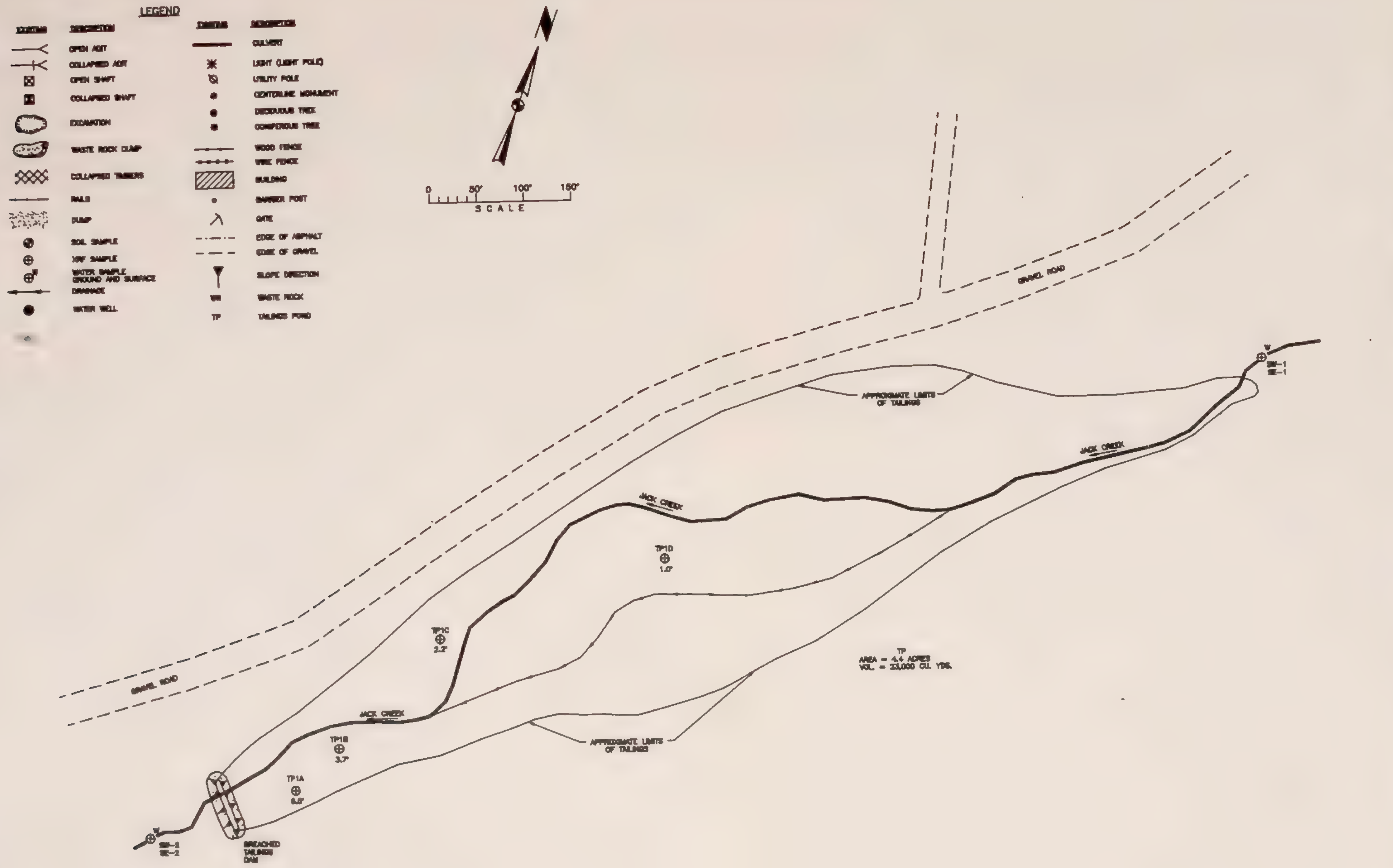
No.	Location	Depth	Yield	Static Water Level
5807	07N 06W 22	175.0	15.0	20.00



PIONEER
TECHNICAL SERVICES, INC.

JACK CREEK TAILINGS, P.A. NO. 22-296

T07N, R06W, SECTION 14
SCALE: 1" = 1000'



DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

PIONEER

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS—BOZEMAN—KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

JACK CREEK TAILINGS PA# 22-296
BASIN DISTRICT JEFFERSON COUNTY

SHEET NO.

22-296.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): 90% medium to coarse sand, 10% fines

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Depth ranges from 1 foot to 6.5 feet, with an average depth of 3.5 feet.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Mostly wet

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Impoundment has been breached.

Comments on potential for mitigation: Isolate tailings from stream, amend, and revegetate.

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1A-A	TAIL	23,000	Near dam (south end); coarse brown sand, 0'-3.5'	None	6.0 (D)	0.03	22-296-TP-1	07/06/93 2000	T-Metals, ABA
TP-1A-B	TAIL		Black peat, like clay, wet, 3.5'-4.5'	None	6.5 (D)	0.03			
TP-1A-C	TAIL		Gray silty sand, wet, 4.5'-5'	None	6.5 (D)	0.045			
TP-1B-A	TAIL		Approx. 150' upstream from dam; brown/orange coarse sand, 0'-1.5'	None	7.0 (D)	0.035			
TP-1B-B	TAIL		Tan/brown, wet, coarse sand, 1.5'-2.8'	None	7.0 (D)	0.05			
TP-1B-C	TAIL		Gray/green silt, 2.8'-3.2'	None	6.7 (D)	0.025			
TP-1B-D	TAIL		Dark gray coarse sand, soil layer, 3.2'-3.7'	None	6.5 (D)	0.025	N/A	N/A	XRF Analysis
TP-1C-A	TAIL		Approx. 400' upstream from dam; orange/brown coarse sand, 0'-1.2'	None	7.0 (D)	0.045	22-296-TP-2	07/06/93 2030	T-Metals, ABA
TP-1C-B	TAIL		Gray sandy silt, 1.2'-1.8'	None	6.8 (D)	0.04			
TP-1C-C	TAIL		Dark gray coarse sand, 1.8'-2.2'	None	6.2 (D)	0.03			
TP-1D-A	TAIL		Approx. 600' upstream from dam; brown/orange coarse sand, 0'-1'	None	NM	0.025			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-296-TP-1 is composite of TP-1A-A through -1A-C, and TP-1B-A through -1B-C. 22-296-TP-2 is composite of TP-1C-A and -1C-B, and TP-1D-A.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:______________

Filled shafts: Yes___, No X , Number:____ Identification:______________

Seeps/Springs: Yes___, No X , Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 9

Distance to nearest well used for drinking? Approx. 3 miles

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible X , Unlikely____.
Contaminate tailings are in contact with shallow alluvial aquifer.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ______

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Jack Creek

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes ___, No X, Name(s)/Description: ___

Waste materials within any floodplain: Yes X, No ___ Source ID(s): Jack Creek runs through and alongside Jack Creek Tailings.

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? ___
High Flow: 40 cfs, Average Flow: 4 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No ___,
Describe: Jack Creek runs through and alongside Jack Creek Tailings.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetlands, irrigation, fishery, stock watering

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___, Distance downstream (ft)? >1000 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Tailings eroded from creek; tailings present in the sediments.

SURFACE WATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow' cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-2	SW	Downgradient of tailings on Jack Creek	6.68	81	257	9.4	16	4.3 cfs (M)	22-296-SW-2	07/06/93 1800	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Downgradient of tailings of Jack Creek	N/A	N/A	N/A	N/A	N/A	N/A	22-296-SE-2	07/06/93 1800	T-Metals
SW-1	SW	Upgradient of tailings on Jack Creek	7.05	79	216	8.5	37	4.2 cfs (M)	22-296-SW-1	07/06/93 1830	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Upgradient of tailings on Jack Creek	N/A	N/A	N/A	N/A	N/A	N/A	22-296-SE-1	07/06/93 1830	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 0.25 acre in drainage below tailings; 7 acres in tailings area if tailings were consolidated

Wetlands present: Yes X , No___, **Describe:** Some wetlands now starting at head of tailings

Carbonate rocks/soils: Yes___, No X , **Describe:**

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments Primarily recreational cabins

Nearest residence(ft or miles)? 0.5 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Belanger

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
TP-1	FEOX; VEG	Partial	191,664	95,832	No	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments Recreational cabins

Evidence of recreational use on site: Yes_X_, No___, Describe:
Motorcycle tracks

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment
Wilderness Area - Yes___, No_X_, Comment
T&E Species Habitat - Yes___, No_X_, Comment
Bat Habitat - Yes___, No_X_, Comment

Primary Drainage_X_; Secondary Drainage___; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:

Hazardous structures: Yes___, No_X_, Number____, types and locations:

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number____, types and locations: Tailings are actively eroded by Jack Creek.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:

Bibliography

MBMG, Sampling and Analysis Plan and Analytical Data for Jack Creek Tailings, Provided by Ted Duaime, Date Unknown.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Jack Creek Tailings, Prepared by Northern Engineering and Testing, July 27, 1988.

USGS, Topographic Map, Basin, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

JACK CREEK TAILINGS
PA NO. 22-296

MDSL AMRB/PIONEER 4/9/93

Jack Creek Tailings PA# 22−296
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER − BULLOCK
INVESTIGATION DATE: 07/06/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22−296−SE−1	573	31.5	4.2	12.9	16.1	127 J	26700	0.013 UJ	579	7 J	158	6 U	284 J	NR
22−296−SE−2	263	24.2	1.7	7.6	3.1 J	83.1 J	8890	0.015 J	440 J	3 U	79 JX	8 UJ	201	NR
22−296−TP−1	132	141	4.0	14.7	15.6	91.1 J	26800	0.044	402	21 J	147	6 U	348 J	NR
22−296−TP−2	1890	67.2	2.2	8.4	7.5 J	381 J	21500	0.096 J	215 J	6	681 JX	26 J	323	NR
BACKGROUND	68 J	344	0.6 U	22.1	20.3	35	35000	0.08 J	6830	21	39 J	5 U	188	NR

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22−296−SE−1	0.03	0.94	4.05	3.12	0.02	<0.01	0.01	0	4.05
22−296−SE−2	0.01	0.31	3.1	2.79	<0.01	<0.01	0.01	0	3.1
22−296−TP−1	0.08	2.5	4.76	2.26	0.01	0.03	0.04	0.94	3.82
22−296−TP−2	0.08	2.5	1.63	−0.8	0.05	0.01	0.02	0.31	1.32

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22−296−SW−1	20.8 J	13.1	3.83	9.7 U	6.83 U	63.6 J	723	0.038 U	145	12.7 U	8.96 J	30.7 U	416	25.6
22−296−SW−2	36.5 J	17.7	2.57 U	9.7 U	6.83 U	65.2 J	1170	0.038 U	156	20.4	14.7 J	30.7 U	411	25.5

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2−N	CYANIDE
22−296−SW−1	58	< 5.0	10	< 0.05	NR
22−296−SW−2	54	< 5.0	14	< 0.05	NR

LEGEND

SE1 − Upgradient of tailings on Jack Creek.
SE2 − Downgradient of tailings on Jack Creek.
TP1 − Composite of subsamples TP1A−A, B, C, and TP1B−A, B, C.
TP2 − Composite of subsamples TP1C−A, B, and TP1D−A.
BACKGROUND − From the Bullion Mine (22−008−SS−1).

SW1 − Same as sample SE1.
SW2 − Same as sample SE2.

XRF ANALYSIS RESULTS

JACK CREEK TAILINGS
PA NO. 22-296

MDSL AMRB/PIONEER 4/9/93

Mine Name: Jack Creek Tailings PA#22-296
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-296-TP1A-A		21170.4	9154.92	1524.2		810.06 *	16728.7		122.837 *	361.535	216.564	378.02
22-296-TP1A-B		19307.5	10919.9	3148.29		781.3 *	34392.3		75.4269 *	214.292	81.7473 *	253.301
22-296-TP1A-C		15366	13897.8	3202.5		578.403 *	34743.7		58.3626 *	387.884	172.815	297.318
22-296-TP1B-A		22651.4	10437.7	1449.7		838.637 *	15785.6		113.104 *	375.408	128.449	357.158
22-296-TP1B-B		20038.6	9026.33	1531.83		338.661 *	14021.6		38.6861 *	409.203	60.2076 *	310.964
22-296-TP1B-C		18367.5	12622.1	3648.26		719.014 *	37418.6		97.322 *	372.134	105.973 *	271.844
22-296-TP1B-D		16550.3	11274.9	2529.76		490.634 *	27435.7		64.0716 *	156.057	96.5175 *	341.589
22-296-TP1C-A		13322.4	6943.03	1785.81		603.045 *	30663.2		311.083	393.153	2338.78	210.578
22-296-TP1C-B		11782.3	7796.37	2350.89		608.748 *	26221.1		278.909	561.737	1040.8	311.305
22-296-TP1C-C		12203.7	9501.22	3213.1		610.412 *	25614			183.067	128.23	269.698
22-296-TP1D-A		11746.3	4925.82	1765.54		456.577 *	34768.3		918.642	336.874	3562.11	172.674
22-296-TP-1-COMP		18194.6	13166.6	3793.76		752.09 *	34104.2		121.102 *	475.677	136.524	328.202
22-296-TP-2-COMP		14127	6505.92	1571.93		495.31 *	26734		387.673	277.418	1926.15	247.205
22-296-TP-2-COMP-DUP		13193.2	6716.92	1747.59		390.744 *	29388.6		327.972	295.941	2247.96	238.988

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-296-TP1A-A	110.592			75.3674	180.402		56.7553 *	654.402			8.9554 *
22-296-TP1A-B	244.512			53.2364 *	174.799			521.034		28.89 *	26.0057
22-296-TP1A-C	270.496			181.938	170.746			364.622		21.1022 *	32.3328
22-296-TP1B-A	92.1272			42.5114 *	186.511			613.84			6.99143 *
22-296-TP1B-B	96.7138			35.1473 *	175.791			584.777			10.246 *
22-296-TP1B-C	179.738			140.822	183.029			405.889		29.1194 *	33.0687
22-296-TP1B-D	126.635			28.5906 *	179.759			668.73			15.1745 *
22-296-TP1C-A	129.585		7.72672 *	656.412	146.889		91.5115 *	361.671		11.0431 *	24.5907 *
22-296-TP1C-B	128.295			205.345	159.914			503.329		13.9079 *	21.2171 *
22-296-TP1C-C	232.827			26.2843 *	171.792			399.588		14.942 *	20.7291 *
22-296-TP1D-A	135.474		8.66309 *	1126.53	143.181		120.047 *	297.557		30.6031 *	23.3938 *
22-296-TP-1-COMP	200.833			111.688	193.145			692.36		19.9629 *	21.1482 *
22-296-TP-2-COMP	124.668		7.96821 *	560.794	154.344			435.73		15.8114 *	19.3542 *
22-296-TP-2-COMP-	132.41		6.26503 *	545.999	161.478			424.956		22.025 *	17.0374 *

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

JACK CREEK TAILINGS
PA NO. 22-296

AIMSS SCORESHEET

SITE NAME: JACK CREEK TAILINGS
PA NUMBER: 22-296

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	9.226
6	GW - TARGETS	WELLS - 1 MI. x 2.5		2.5
7		WELLS - 1 TO 4 MI		8
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	10.5
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	38749

SURFACE WATER PATHWAY

11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		50
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	450
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	9.555
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	19
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	81695

AIR PATHWAY

25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.275
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		5
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	25
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	688

DIRECT CONTACT PATHWAY

36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	250
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.266
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		5
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 - 42	11
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	732

45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000	**1.22**

SITE NAME: JACK CREEK TAILINGS
PA NUMBER: 22-296

LINE NO.		**SITE SAFETY**		
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	11
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

SUMMARY OF HISTORICAL ANALYTICAL DATA FROM OTHER SOURCES

OLD DOMINION MINE

This site was visited, but no samples were collected.

EMERY MINE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cr	Crc	Crq	NI	NIc	NIq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q853	DDBS10L	0	U		2.65	B		0	U		0	U		112.92			0	U	

BULLION MINE & JACK CREEK TAILINGS

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cr	Crc	Crq	NI	NIc	NIq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q339	BBUS10M	0	U		5.43	B		44.77	B		1968			1.44	B		0	U	
92Q421	BBUS10M	0	U		5.2	B		39.16	B		1892.3			0.93	B		0	U	
92Q338	BBUS20L	0	U		0	U		3.62	B		12.34	B		4.83	B		0	U	
92Q418	BBUS20L	1.18	B		0	U		4.42	B		23.57	B		6.61	B		0.64	B	
92Q337	BBUS30M	0	U		0	U		21.66	B		373.25			2.56	B		0	U	
92Q419	BBUS30M	0	U		0	U		22.83	B		364.97			2.83	B		0	U	
92Q309	BBUS40L	0	U		0	U		4.89	B		31.73	B		2.22	B		0	U	
92Q414	BBUS40L	1.54	B		0	U		4.27	B		28.33	B		2.89	B		0	U	
92Q308	BBUS50H	2.45	B		41.49	B		4698			28230			166.22			0	U	
92Q316	BBUS60M	0	U		4.99	B		71.92			2216			1.3	B		0	U	
92Q413	BBUS60M	0	U		7.64	B		141.2			2685			1.72	B		0	U	
92Q317	BBUS70M	0	U		0	U		0	B		12.96	B		2.34	B		0	U	
92Q315	BBUS80L	0	U		0	U		2.51	B		17.03	B		1.23	B		0	U	
92Q415	BBUS80L	0	U		0	U		0	B		6.04	B		1.35	B		0	U	
92Q318	BBUS90M	0	U		0	U		0	B		6.71	B		0.92	B		0	U	
92Q420	BBUS90M	0	U		0	U		0	U		11.5	B		1.11	B		0	U	
92Q416	BBUSA0M	0	U		0	U		0	B		8.65	B		1.58	B		0	U	
92Q340	BBUSA0M	0	U		0	U		0	U		5.53	B		1.35	B		0	U	
92Q417	BBUSB0L	0	U		0	U		24.86	B		413.58			3.18	B		0	U	
92Q341	BBUSB0L	0	U		1.42	U		27.37	B		442.75			3.11	B		0	U	
92Q314	BBUSC0L	0	U		0	U		0	U		2.83	B		0	U		0	U	
92Q319	BBUSD0L	0	U		0	U		0	U		4.41	B		0	U		0	U	
92Q310	BBUSTRP	0	U		2.32	U		0	U		23.01	B		0	U		0	U	

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq

OLD DOMINION MINE

This site was visited, but n

EMERY MINE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
92Q853	DDBS10L	0	U		11.29	B		0	U				

BULLION MINE & JACK CREE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
92Q339	BBUS10M	22.71			18.64	B		0.5	B		0.07	B	
92Q421	BBUS10M	20.25			14.8	B		0	U		0.05	B	
92Q338	BBUS20L	0	U		10.1	B		0.94	B		0.05	B	
92Q418	BBUS20L	0	U		14.57	B		0.82	B		0	U	
92Q337	BBUS30M	3.98	B		15.64	B		0	U		0.1	B	
92Q419	BBUS30M	3.83	B		18.74	B		0	U		0	U	
92Q309	BBUS40L	0	U		19.87	B		1.21	B		0.14	B	
92Q414	BBUS40L	0	U		23.19	B		1.4	B		0	U	
92Q308	BBUS50H	397.32			20.27	B		167.58			0.14	B	
92Q316	BBUS60M	20.55			14.05	B		0.53	B		0.12	B	
92Q413	BBUS60M	74.49			25.57	B		1.05	B		0	U	
92Q317	BBUS70M	0	U		41.37	B		0	U		0.12	B	
92Q315	BBUS80L	0	U		34.95	B		0	U		0.19	B	
92Q415	BBUS80L	0	U		44.64	B		0.72	B		0	U	
92Q318	BBUS90M	0	U		31.24	B		0	U		0.15	B	
92Q420	BBUS90M	0	U		35.92	B		0	U		0	U	
92Q416	BBUSA0M	0	U		42.33	B		0	U		0	U	
92Q340	BBUSA0M	0	U		37.49	B		0	U		0.15	B	
92Q417	BBUSB0L	4.45	B		22.14	B		0	U		0	U	
92Q341	BBUSB0L	4.64	B		18.75	B		0	U		0.07	B	
92Q314	BBUSC0L	0	U		4.61	B		0	U		0.12	B	
92Q319	BBUSD0L	0	U		0	U		0	U		0	U	
92Q310	BBUSTRP	0	U		0	U		0.55	B		0.05	B	

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
TOTAL RECOVERABLE METALS: (ppb)																			
92Q1128	BBUS10M	0	U		5.33	B		243.42			2308			20.24			0	U	
92Q1125	BBUS20L	0	U		0	U		3.11	B		13.17	B		8.36	B		0	U	
92Q1126	BBUS30M	0	U		0	U		51.69			429.78			8.67	B		0	U	
92Q1121	BBUS40L	0	U		0	U		3.72	B		18.13	B		3.02	B		0	U	
92Q1120	BBUS60M	0	U		6.71	B		358.47			3138			36.9			0	U	
92Q1122	BBUS80L	0	U		0	U		0	U		0	U		2.55	B		0	U	
92Q1127	BBUS90M	0	U		0	U		0	U		6.99	B		2.05	B		0	U	
92Q1123	BBUSA0M	0	U		0	U		0	U		0	U		2.48	B		0	U	
92Q1124	BBUSB0L	0	U		0	U		54.55			450.43			9.23	B		0	U	
TOTAL METALS: (ppm)																			
92S311	BBUD10H	2.70	B		2.01	B		309.47			1937.00			7835.00			30.92		
92S312	BBUD20H	0.00	U		1.37	B		49.19	B		86.56			794.20			5.14	B	
92S320	BBUD30L	4.07	B	N	1.23	B	N	398.73		N	1055.62			10979.29			33.56		N
92S321	BBUD40L	0.00	U	N	0.94	B	N	0.00	U	N	0.00	U		5.82	B		0.00	U	N
92S322	BBUD50L	0.00	U	N	0.00	U	N	0.00	U	N	6.92	B		0.00	U		0.00	U	N
92S313	BBUDTRP	0.00	U		0.00	U		0.00	U		13.72	B		0.00	U		0.00	U	

ENTERPRISE AND BUCKEYE MINES

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
DISSOLVED METALS: (ppb)																			
92Q346	BBAS10H	2.79	B		19.40	B		609.00			15020.00			3438.05			0.00	U	
92Q345	BBAS20L	0.00	U		0.00	U		3.69	B		10.69	B		2.36	B		0.00	U	
92Q344	BBAS30H	2.36	B		15.41	B		1879.00			15730.00			235.31			0.72	B	
92Q355	BBAS40L	0.00	U		2.37	U		12.88	B		152.50			20.16			0.00	U	
92Q366	BBAD40L																		
TOTAL METALS: (ppm)																			
92S347	BBAD10H	2.40	B	N	0.00	U	N	238.40		N	117.00			4568.00			58.66		N
92S356	BBAD20H	5.95	B	N	3.86	B	N	149.43		N	259.75			7698.00			28.17		N
92S357	BBAD30H	4.02	B	N	2.82	B	N	95.56		N	137.51			9173.00			22.22		N
92S367	BBAS50L	0.00	U	N	0.00	U	N	0.00	U	N	6.90	B		0.00	U		0.00	U	N

CRYSTAL MINE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
TOTAL RECOVERABLE METALS: (ppb)													
92Q1128	BBUS10M	18.18			16.83	B		7.85			0.07	B	
92Q1125	BBUS20L	0	U		31.65	B		0.54	U		0.08	B	
92Q1126	BBUS30M	2.34	B		18.93	B		1.64	B		0.07	B	
92Q1121	BBUS40L	0	U		16.2	B		0	U		0.08	B	
92Q1120	BBUS60M	26.44			18.06	B		12.66			0.08	B	
92Q1122	BBUS80L	0	U		38.89	B		0	U		0.08	B	
92Q1127	BBUS90M	0	U		41.15	B		0	U		0.08	B	
92Q1123	BBUSA0M	0	U		42.19	B		0	U		0.06	B	
92Q1124	BBUSB0L	2.31	B		19.88	B		1.42	B		0.08	B	
TOTAL METALS: (ppm)													
92S311	BBUD10H	8.90	B		53.66	B		5356.00			2.37		
92S312	BBUD20H	1.30	B		40.94	B		504.37			0.70		
92S320	BBUD30L	8.13	B	N	85.00	B	N	2445.77			1.71		
92S321	BBUD40L	0.51	B	N	0.00	U	N	3.27	B		0.21	B	
92S322	BBUD50L	0.58	B	N	0.00	U	N	0.00	U		0.25	B	
92S313	BBUDTRP	0.51	B		0.00	U		0.00	U		0.23	B	

ENTERPRISE AND BUCKEYE

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
DISSOLVED METALS: (ppb)													
92Q346	BBAS10H	119.50			22.24	B		1173.66			0.00	U	
92Q345	BBAS20L	0.00	U		12.62	B		0.00	U				
92Q344	BBAS30H	156.82			10.31	B		128.37					
92Q355	BBAS40L	1.54	B		12.59	B		11.20			0.11	B	
92Q366	BBAD40L										0.07	B	
TOTAL METALS: (ppm)													
92S347	BBAD10H	5.43	B	N	140.98	B	N	4029.00			0.68		
92S356	BBAD20H	3.42	B	N	59.93	B	N	5841.00			1.10		
92S357	BBAD30H	1.99	B	N	63.20	B	N	3946.00			0.83		
92S367	BBAS50L	0.00	U	N	0.00	U	N	0.00	U		0.37	B	

CRYSTAL MINE

DISSOLVED METALS: (ppb)

22-296, #15: TP-1B, facing south

22-296, #16: TP-1A, facing northwest

22-296, #17: SW-2 sample location, facing northwest

22-296, #18: TP-1, facing northwest

22-296, #19: TP-1C, facing west

22-296, #20: TP-1D, facing east

22-296, #21: SW-1 sample location, facing northwest

22-296, #22: WR-1, facing south

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: MARGUERITE **PA#:** 22-301

Date: July 9, 1993 **Time:** 0910

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Warm (60°F); partly cloudy; no breeze; cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #21: WR-1; #22: Collapsed adit with standing water; #23: WR-2.
Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Dumps that have not been revegetated, could be recontoured and seeded.

MDSL AMRB/PIONEER 4/9/93

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MARGUERITE PA#: 22-301

Legal Description: T 6N ;R 5W ;Sec. 6 , NE1/4 NW1/4 ___1/4

County: JEFFERSON Mining District: BASIN

Latitude: N 46° 18' 30" Longitude: W 112° 16' 28"

Primary Drainage Basin and Code: Basin Creek/10020006
Secondary Drainage Basin: Lily-of-the-West Gulch

USGS Quadrangle map name(s): Basin

Mine Type/Commodities: Hardrock/Gold, Silver

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Laura Robin, 209 North 3rd, Bozeman, MT 59715; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Unknown

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? No known permit; part of WR-2 has been used to backfill shaft #2.

General site features: Elevation 6500' , Slope 5° ,
Aspect East and West

Land use: Mining___, Recreational X , Residential___, Urban___,
Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? < 1 acres.
Dimensions:

Predominant vegetation types: Fir, grasses

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites).
Seasonal Forest Service restrictions on roads in area.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There is 1 well log within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by narrow quartz vein; cretaceous and tertiary volcanic rocks and granitic rocks of the Boulder Batholith. The site lies in headwater area of Lily-of-the-West Gulch well above the drainage. Lily-of-the-West flows south away from the site to confluence with Basin Creek 1 1/2 mile away.

Mining/milling history, ore type/tenor, host rock, gangue: Periods of operation is unknown. Production from 1914 to 1942 was 38 oz. Au and 960 oz. Ag. Iron pyrite is mineral and gangue is quartz.

Mine Operation?

Shafts - Yes X, No ___, # 3, Comment Backfilled with dump material; collapsed

Adits - Yes X, No ___, # 1, Comment Partially collapsed

Pits - Yes ___, No X, # ___, Comment ___

Placers - Yes ___, No X, # ___, Comment ___

Other - Yes ___, No X, # ___, Comment ___

Mill Operation? Yes ___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

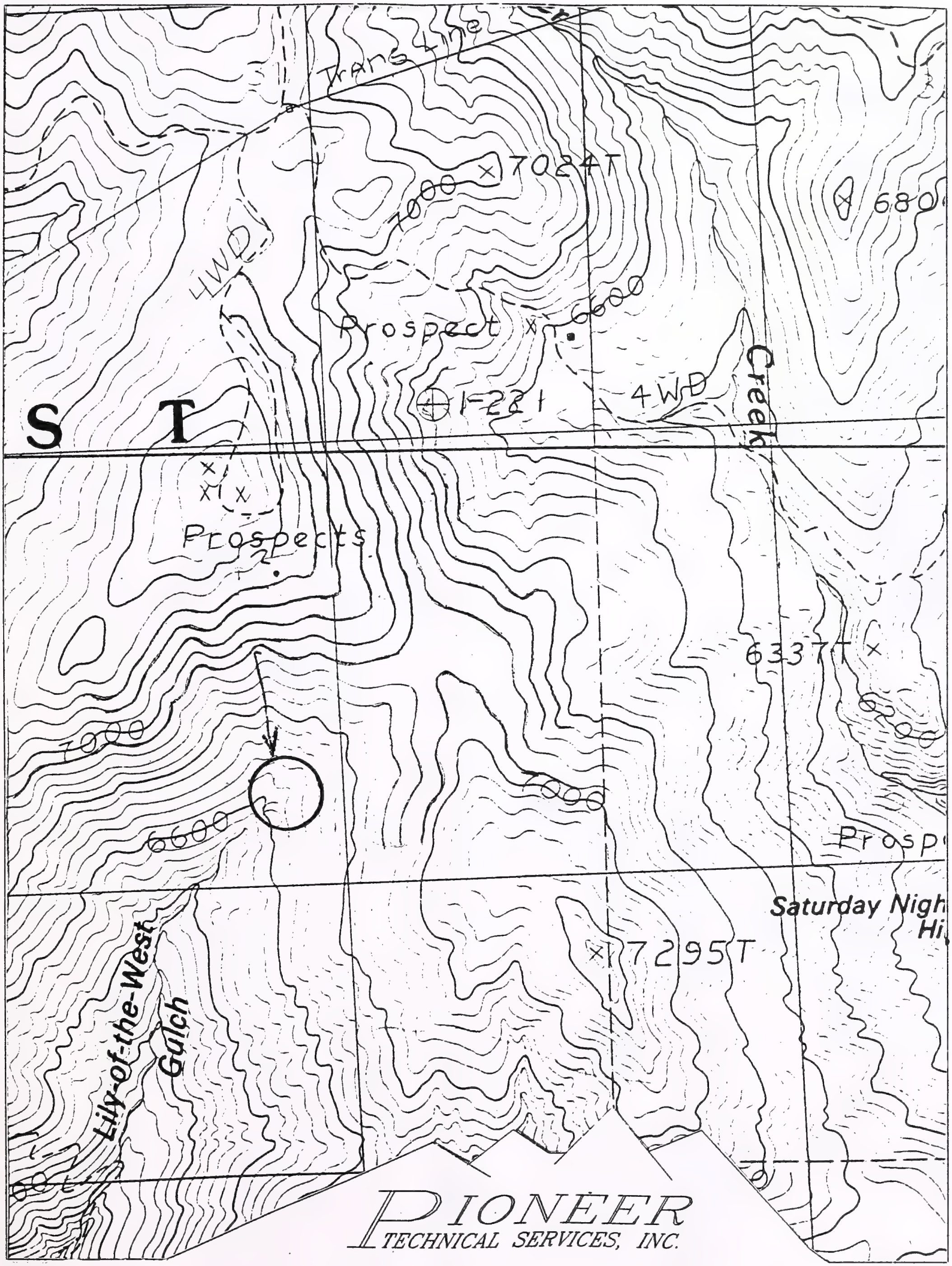
Origin of Ore Milled - Custom Mill___ Dedicated Mill___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A

Montana Bureau of Mines and Geology
Water Well Log Data

11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M:53420	06N 05W 07 DCB	25.0	30.0	10.00

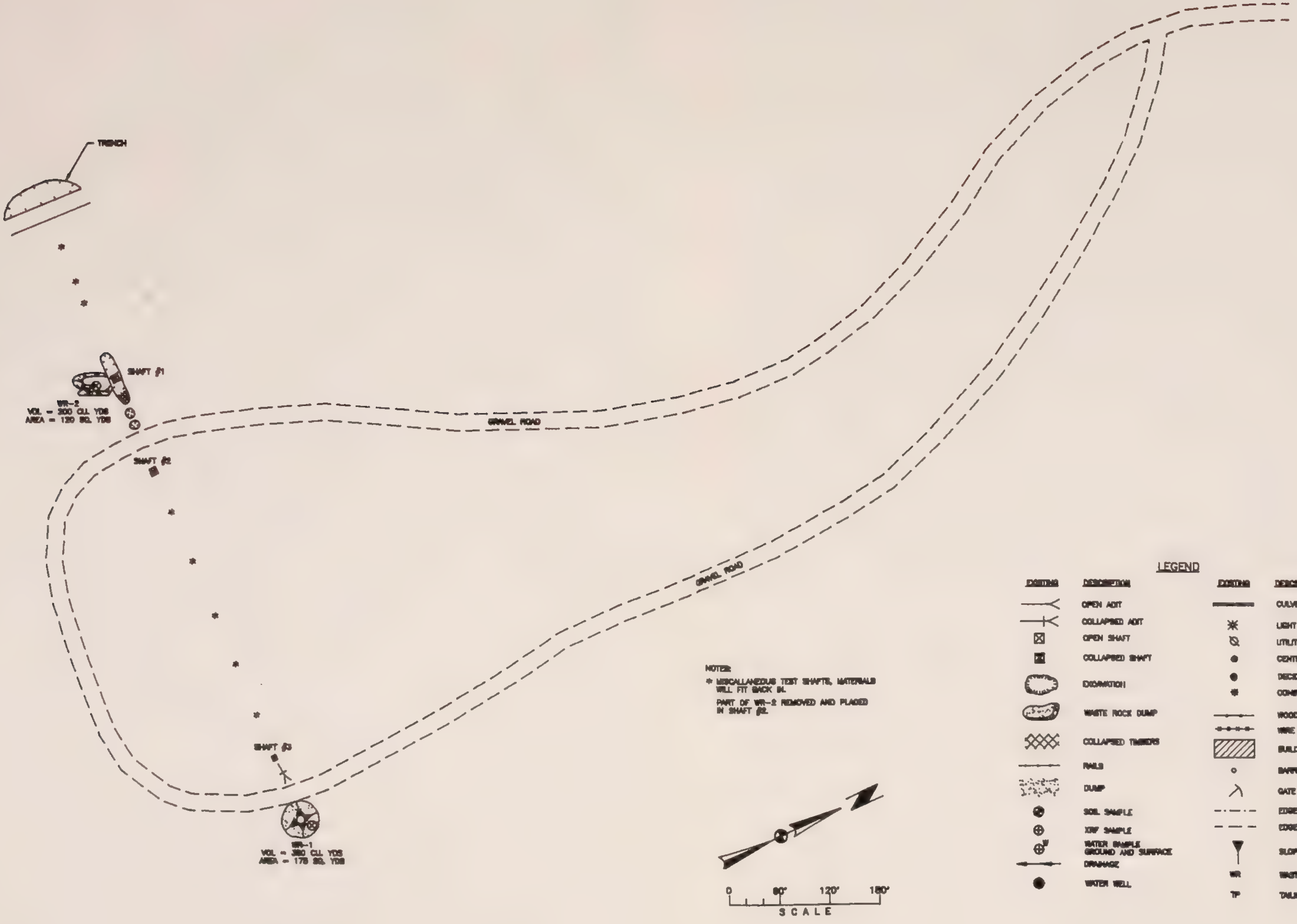


PIONEER
TECHNICAL SERVICES, INC.

MARGUERITE, P.A. NO. 22-301

T06N, R05W, SECTION 06

SCALE: 1" = 1000'



NOTES:

* MISCALLANEOUS TEST SHAFTS, MATERIALS WILL FIT BACK IN.

PART OF WR-2 REMOVED AND PLACED IN SHAFT #2.

LEGEND

EXISTING	DESCRIPTION	EXISTING	DESCRIPTION
—≺	OPEN ADIT	▬	CULVERT
—+≺	COLLAPSED ADIT	✳	LIGHT (LIGHT POLE)
⊠	OPEN SHAFT	⊘	UTILITY POLE
■	COLLAPSED SHAFT	•	CENTERLINE MONUMENT
⬭	EXCAVATION	●	DECIDUOUS TREE
⬭	WASTE ROCK DUMP	✱	CONIFEROUS TREE
⨯⨯⨯	COLLAPSED TIMBERS	—•—•—	WOOD FENCE
—+—+—	RAILS	-•-•-•-	WIRE FENCE
⁘	DUMP	▨	BUILDING
⊗	SOIL SAMPLE	○	BARRIER POST
⊕	XRF SAMPLE	⋏	GATE
⊕W	WATER SAMPLE GROUND AND SURFACE	— · — · —	EDGE OF ASPHALT
—◆—	DRAINAGE	— — —	EDGE OF GRAVEL
●	WATER WELL	▼	SLOPE DIRECTION
		WR	WASTE ROCK
		TP	TAILINGS POND

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

MARGUERITE PA# 22-301
BASIN DISTRICT JEFFERSON COUNTY

PIONEER

DRAWN MMC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

TD&H

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

SHEET NO.

22-301.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution(approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable(based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment(Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	380	Lower west waste rock associated with adit	None	6.0 (D)	0.05	22-301-WR-1	07/09/93 1530	T-Metal, ABA
WR-2	WR	200	Upper east waste rock dump	None	6.8 (D)	0.06			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-301-WR-1 is composite of WR-1 and WR-2.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:__________

Filled shafts: Yes___, No X , Number:____ Identification:__________

Seeps/Springs: Yes___, No X , Number:____ Identification:__________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 29

Distance to nearest well used for drinking? 3 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely X .
Uncontained sources, but no shallow water.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

MDSL AMRB/PIONEER 4/9/93

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X , Name(s):

Dry streambeds: Yes____, No X , Name(s):

Other surface water: Yes____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes____, No X Source ID(s):

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A

Distance between waste source(s) and nearest surface water body (ft)? N/A

Surface water draining onto or through waste sources: Yes____, No X , Describe: N/A

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) N/A

Observed erosional/sedimentation/stream turbidity problems? Yes____, No X , Distance downstream (ft)?________ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): N/A

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	QA/QC bottle blank	N/A	N/A	N/A	N/A	N/A	N/A	22-301-SW-1	07/09/93 2000	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? N/A

Wetlands present: Yes___, No_X_, Describe:

Carbonate rocks/soils: Yes___, No_X_, Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100_X_; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	None	Moist	1,575	788	No	Low
WR-2	None	Moist	1,080	540	No	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments_None_________

Evidence of recreational use on site: Yes_X_, No___, Describe:_Tire tracks_________

Accessibility - Fences, warning signs, closed roads?_Unrestricted___

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment________
Wilderness Area - Yes___, No_X_, Comment________
T&E Species Habitat - Yes___, No_X_, Comment________
Bat Habitat - Yes_X_, No___, Comment_Adit_______

Primary Drainage_X_; Secondary Drainage___; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1_, types and locations:___ At WR-2_________

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________

Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Marguerite, Prepared by Northern Engineering and Testing, July 25, 1988.

USGS, Topographic Map, Basin, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

MARGUERITE
PA NO. 22-301

Marguerite PA# 22−301
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER − BABITS
INVESTIGATION DATE: 07/09/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22−301−WR−1	70 JX	341	0.4 U	3.9	1.3 U	31.6	11000	1.24 J	302 J	3	422	11 J	83	NR
BACKGROUND	15	65.1	0.5 U	4	6.3 J	10.3 J	9160	0.01 J	344 J	6	11 JX	7 UJ	94	NR

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22−301−WR−1	0.05	1.56	3.36	1.8	0.05	<0.01	<0.01	0	3.36

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22−301−SW−1	1.49 U	2.01 U	2.57 U	9.7 U	6.83 U	1.55 U	11.8 U	0.038 U	4.08 U	12.7 U	4.14 J	30.7 U	7.57 U	0.2

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

LEGEND

WR1 − Composite of subsamples WR1 and 2.
BACKGROUND − From Morning Glory (22−077−SS−1)
SW1 − Bottle Blank.

XRF ANALYSIS RESULTS

MARGUERITE
PA NO. 22-301

MDSL AMRB/PIONEER 4/9/93

Mine Name: Marguerite PA# 22-301
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-301-WR-1		28055.8	3982.68	1211.94			16140.5		50.9368 *	53.1709 *	41.6489 *	102.372
22-301-WR-1-COMP			4408.78	1093.7	147.167 *		12550.2			88.2928 *		97.3925
22-301-WR-1-COMP-DUP			4232.69	1091.39	146.978 *		12510.1			69.1675 *		88.8912
22-301-WR-2		24988.4	1702.6	905.838	177.771 *		12280.7		45.5846 *			70.529

XRF SAMPLE ID	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-301-WR-1	138.902		4.35845 *	157.984	179.424			692.406	65.9937 *	25.6721 *	11.988 *
22-301-WR-1-COMP	131.282		4.41208 *	308.994	177.892		54.6411 *	558.216			11.0383 *
22-301-WR-1COMPDUP	134.935		7.09527 *	286.137	180.373		34.5137 *	558.451			10.799 *
22-301-WR-2	121.751		6.5807 *	522.248	176.07		66.7641 *	585.186	78.1934 *	27.1556 *	16.203 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

MARQUERITE
PA NO. 22-301

MDSL AMRB/PIONEER 4/9/93

AIMSS SCORESHEET

SITE NAME: MARGUERITE
PA NUMBER: 22-301

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.142
6	GW - TARGETS	WELLS - 1 MI. x 2.5		2.5
7		WELLS - 1 TO 4 MI		28
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	30.5
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	866

SURFACE WATER PATHWAY

11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		0
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	0
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	0
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.155
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		0
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	1
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	0

AIR PATHWAY

25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.005
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	40
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	10

DIRECT CONTACT PATHWAY

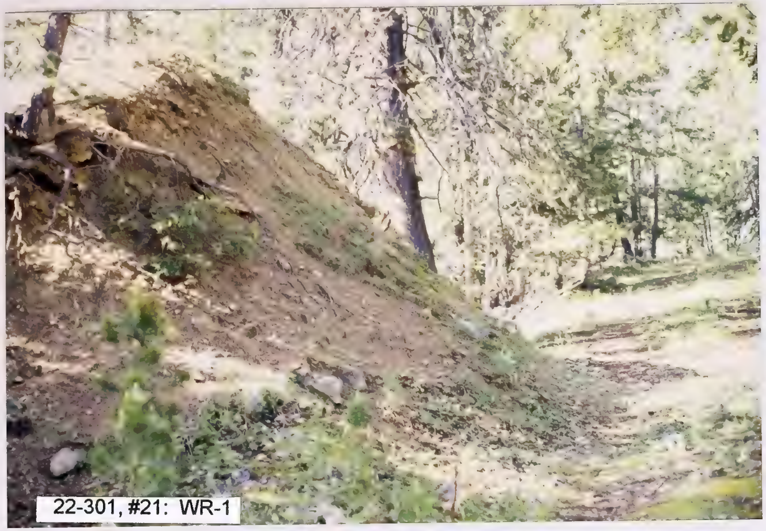
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.005
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	2
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	2

45 **TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE**
(LINES 10 + 24 + 35 + 44) / 100,000 **0.01**

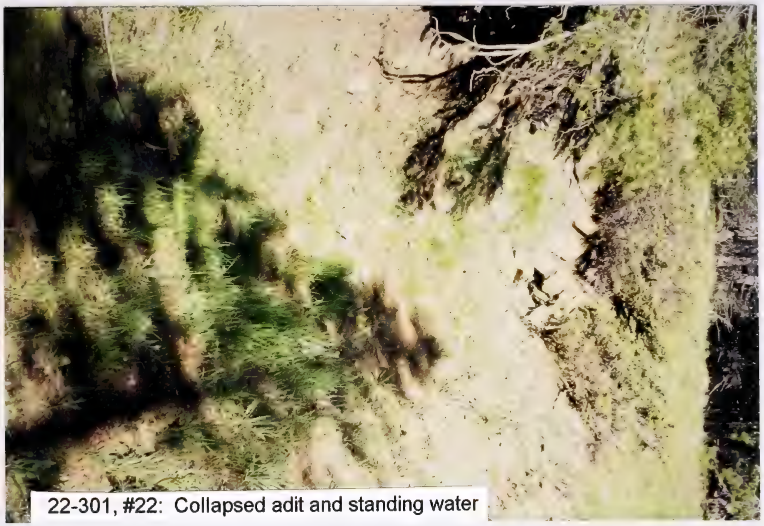
SITE NAME: MARGUERITE
PA NUMBER: 22-301

SITE SAFETY

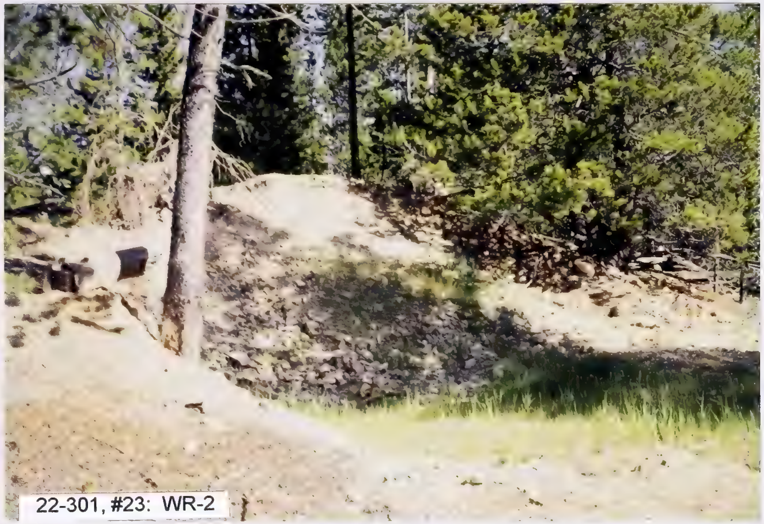
LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	50
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	50
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	2
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**2.00**



22-301, #21: WR-1



22-301, #22: Collapsed adit and standing water



22-301, #23: WR-2

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: MANTLE EAST **PA#:** 22-032

Date: July 7, 1993 **Time:** 1730

Field Team Leader: Babits, Pioneer

Sampling Personnel: Lasher, Pioneer
Pierson, TD&H

Visitors: None

Weather/Seasonality Observations: Cool (50°F); rainy; slight breeze; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #13: WR-1 bottom; #14: WR-3 top; #15: Shaft at WR-4; #16: Mantle on Cataract Creek Road. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): Mantle East is two sites; one is on west side of Cataract Creek Road, and the other is accessed up Big Limber Gulch.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Site #2 is beginning to revegetate itself. Site #1 is in Cataract Creek; although the metals are not significantly elevated, the site could by bermed out of the creek.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MANTLE EAST PA#: 22-032

Legal Description: T 6N ;R 5W ;Sec. 9 , SE1/4 NW1/4 ___1/4

County: JEFFERSON Mining District: CATARACT

Latitude: N 46° 17' 26" Longitude: W 112° 14' 21"

Primary Drainage Basin and Code: Boulder River/10020006
Secondary Drainage Basin: Cataract Creek

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Gold

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact(Include address and phone when available): George H. Sullivan, Box 593, Eric, CO 80516. (303) 828-3056.

Relationship to other mines/sites in the area/district: Many mines in area, but no relationship to this site.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Site #2 has leveled dumps and an adit with a culvert closure.

General site features: Elevation 5600' , Slope 10°(#1), 20°(#2), Aspect West facing slope adjacent to Cataract Creek (#2); East facing slope adjacent to Cataract Creek (#1).

Land use: Mining___, Recreational___, Residential___, Urban___, Agricultural___, Other(Specify) Private

Area of disturbed/unvegetated lands? 1 acres.
Dimensions:

Predominant vegetation types: Aspen, fir, grasses

Access: roads - good___,poor___,4wd X ,trail___.
Other logistical considerations (proximity to other sites). Good to site #1, then must cross Cataract Crk. (no road) by wading; good to site #2 until cable gate, then walk.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 9 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by cretaceous and tertiary volcanic rocks and granitic rocks of the Boulder Batholith. Cataract Creek divides Site #1 (west side) and Site #2 (east side) and Big Limber Gulch is south of Site #2. Big Limber flows into Cataract Creek 1/4 mile below the sites. Cataract Creek flows southwest into Boulder River approx. 1 mile below the site.

Mining/milling history, ore type/tenor, host rock, gangue: Mine operated from 1921 to 1950; mill operation unknown. Boulder Batholith is host rock of vein deposits of quartz gangue with iron pyrite and galena.

Mine Operation?

Shafts - Yes___, No X, # ___, Comment___

Adits - Yes X, No___, # 2, Comment 1 adit at Site #2 with culvert closure; 1 adit collapsed at Site #1

Pits - Yes___, No X, # ___, Comment___

Placers - Yes___, No X, # ___, Comment___

Other - Yes___, No X, # ___, Comment___

Mill Operation? Yes X, No___. If yes answer the next three questions:

Period(s) of Operation: Literature does not give dates.

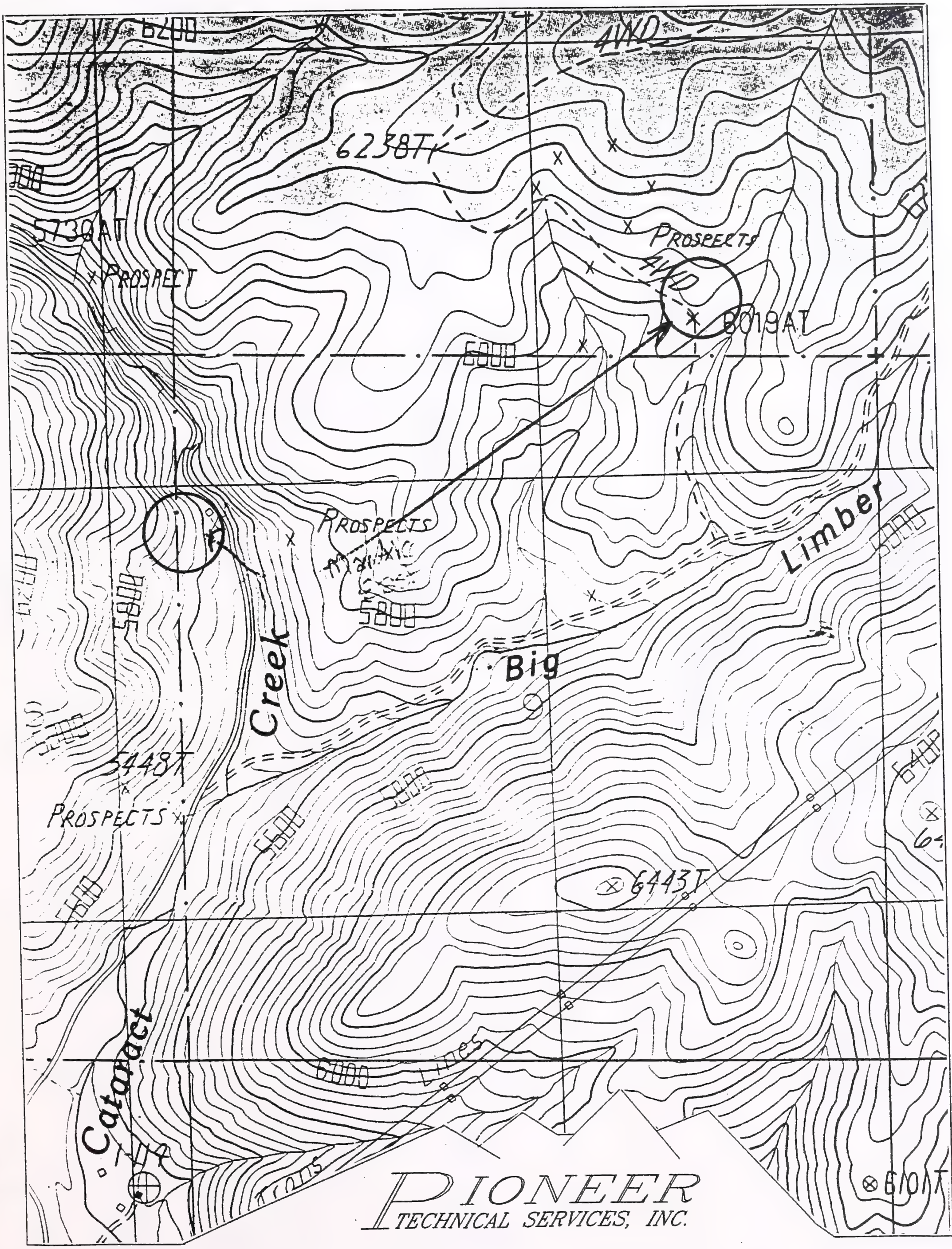
Origin of Ore Milled - Custom Mill___ **Dedicated Mill** X; **Number and names of mines that supplied mill feed:** Unknown

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting? Literature states a water-powered gravity mill.

Montana Bureau of Mines and Geology
Water Well Log Data

11/03/1993

Well No.	Location	Depth	Yield	Static Water Level
M:53421	06N 05W 16	160.0	30.0	60.00
M:53424	06N 05W 17	28.0	5.0	20.00
M:53422	06N 05W 17	25.0	60.0	15.00
M:53425	06N 05W 17	45.0	15.0	8.00
M:53423	06N 05W 17	110.0	10.0	20.00
M:53426	06N 05W 17 C	30.0	0.0	4.00
M:53428	06N 05W 17 CB	123.0	8.0	30.00
M:131806	06N 05W 17 CB	31.0	20.0	16.00
M:53427	06N 05W 17 CB	0.0	2.0	15.00

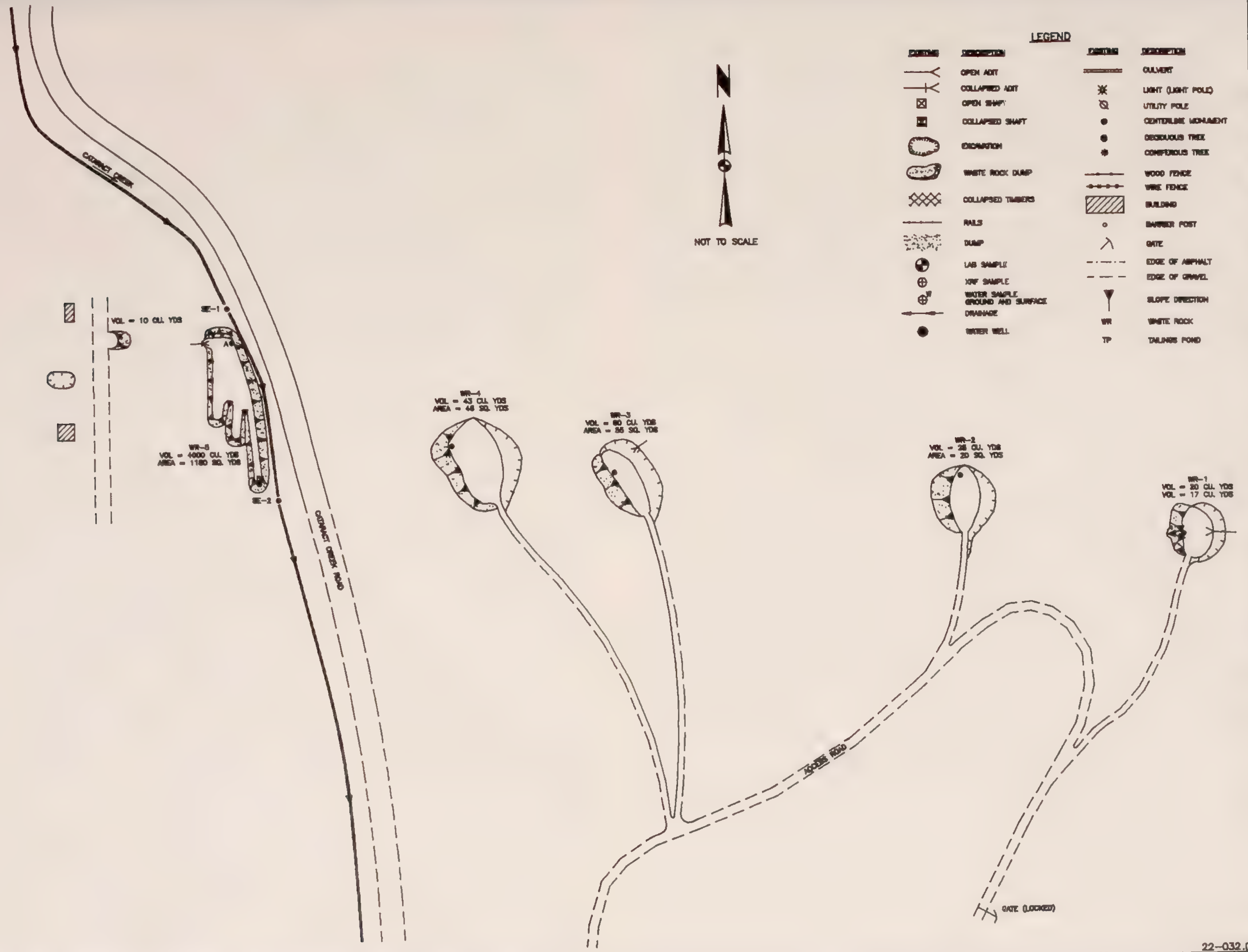


PIONEER
TECHNICAL SERVICES, INC.

MANTLE EAST, P.A. NO. 22-032

T06N, R05W, SECTION 09

SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

MANTLE (EAST) PA# 22-032
CATARACT DISTRICT JEFFERSON COUNTY

PIONEER

TD&H

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

SHEET NO.

22-032.DWG SHEETS

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1	WR	20	Upper waste rock at Site #1	None	4.6 (D)	0.05	22-032-WR-1	07/07/93 2000	T-Metals, ABA
WR-2	WR	25	Waste rock below WR-1 at Site #1	None	5.6 (D)	0.04			
WR-3	WR	60	Waste rock below WR-2 at Site #1	None	5.2 (D)	0.04			
WR-4	WR	43	Waste rock below WR-3 at Site #1	None	5.0 (D)	0.06			
WR-5A	WR	4,000	Northeast end of WR-5 at Site #2	None	4.8 (D)	0.07	22-032-WR-2	07/07/93 2010	T-Metals, ABA
WR-5B	WR		South end of WR-5 at Site #2	None	4.8 (D)	0.05			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-032-WR-1 is composite of WR-1, -2, -3, and -4.
22-032-WR-2 is composite of WR-5A and -5B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:____________

Filled shafts: Yes___, No_X_, Number:____ Identification:____________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs: 37

Distance to nearest well used for drinking? 2 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible____, Unlikely_X_.
Uncontained sources with low metals levels and adjacent to large surfac
water body.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: ______________________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______________________________

____

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Cataract Creek is immediately adjacent to Site #1.

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes ___, No X, Name(s)/Description: ___

Waste materials within any floodplain: Yes X, No ___ **Source ID(s):** Waste rock at Site #1 is in Cataract Creek.

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? 50 during investigation
High Flow: 260 cfs, **Average Flow:** 30 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet between Cataract Creek and Site #1.

Surface water draining onto or through waste sources: Yes ___, No X, **Describe:** ___

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetland, irrigation, fishery

Observed erosional/sedimentation/stream turbidity problems? Yes ___, No X, **Distance downstream (ft)?** N/A **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present)**:** Cataract Creek was flowing at high runoff stage during this investigation.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SE-1	SE	Upgradient on Cataract Creek	N/A	N/A	N/A	N/A	N/A	50 cfs (E)	22-032-SE-1	07/07/93 2005	T-Metals
SE-2	SE	Downgradient of Cataract Creek	N/A	N/A	N/A	N/A	N/A	50 cfs (E)	22-032-SE-2	07/07/93 2000	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No water samples taken due to high flow of creek.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? None

Wetlands present: Yes___, No X , Describe:

Carbonate rocks/soils: Yes___, No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	pH	Moist	153	77	Yes	Low
WR-2	None	Moist	180	90	Yes	Low
WR-3	None	Moist	495	248	Yes	Low
WR-4	None	Moist	405	203	Yes	Low
WR-5	SO3, pH	Moist	10,620	10,620	Yes	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:____________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments None

Evidence of recreational use on site: Yes___, No_X_, Describe:____________________

Accessibility - Fences, warning signs, closed roads? Site #1 access by fording Cataract Crk. (no bridge); site #2 access by walking, locked gate.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment____________
Wilderness Area - Yes___, No_X_, Comment____________
T&E Species Habitat - Yes___, No_X_, Comment____________
Bat Habitat - Yes___, No_X_, Comment____________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium___, Low_X_
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:____________________

Hazardous structures: Yes___, No_X_, Number____, types and locations:____________________

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:____________________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:____________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:____________________

Bibliography

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin No. 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for the Mantle Mine, Prepared by Tierra Buena Contracting, December 27, 1982.

MDSL/AMRB Files, Abandoned Mine Lands Portal Inventory for the Mantle Mine, Prepared by Daphne Digrindakis, July 20, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Mantle (East) site, Prepared by Northern Engineering and Testing, July 2, 1987.

USGS, Topographic Map, Mount Thompson, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

MANTLE EAST
PA NO. 22-032

Mantle (East) PA# 22-032
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – BABITS
INVESTIGATION DATE: 07/07/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-032-SE-1	271 JX	79.2	9.5	17.1	6.9	360	17600	0.048 J	1070 J	6	232	12 J	889	NR
22-032-SE-2	144	45.8	7.4	16.7	3.8 J	254 J	8780	0.016 J	988 J	4	134 JX	9 J	580 JX	NR
22-032-WR-1	20 JX	38.5	0.6 U	8.6	1.7	38.4	11000	0.208 J	1110 J	7	114	7 UJ	136	NR
22-032-WR-2	76 JX	52.3	0.6 U	8.4	2.6	66.6	18000	0.254 J	1020 J	5	288	7 UJ	278	NR
BACKGROUND	15	65.1	0.5 U	4	6.3 J	10.3 J	9160	0.01 J	344 J	6	11 JX	7 UJ	94	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-032-WR-1	0.19	5.94	6.71	0.77	0.08	0.03	0.08	0.94	5.77
22-032-WR-2	0.36	11.2	8.54	-2.7	0.2	0.03	0.13	0.94	7.61

LEGEND

SE1 – Upgradient on Cataract Creek.
SE2 – Downgradient on Cataract Creek.
WR1 – Composite of subsamples WR1, 2, 3, and 4.
WR2 – Composite of WR5A and 5B.
BACKGROUND – From the Morning Glory (22-077-SS-1).

XRF ANALYSIS RESULTS

MANTLE EAST
PA NO. 22-032

MDSL AMRB/PIONEER 4/9/93

Mine Name: Mantle (East) PA# 22-032
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-032-SS-1		12367	7659.35	2650.88		1248.64	24014.5			139.927 *	50.5613 *	213.425
22-032-WR5-A		21093.5	4872.84	1831.1		1498.71	39572.3		51.5166 *	434.204	104.57 *	220.58
22-032-WR5-B		19651.1	8235.09	1587.94		1854.84	21096.1			281.48		233.061
22-032-WR-1		14181.6	8781.23	1919.41		2189.9	23281.2			116.139 *	45.9459 *	263.033
22-032-WR-1-COMP		14294.3	15744.8	2158.59		2228.46	23252.4			158.102	67.3574 *	399.392
22-032-WR-2		16067.7	11920.8	2988.06		1423.46	25597.3			61.8549 *		447.099
22-032-WR-2-COMP		19556.8	6051.25	1738.11		1920.33	31952.2			317.437	141.724 *	240.118
22-032-WR-3		13513.6	12081.6	3009.2		1621.94	25421.1			64.4301 *	59.4175 *	524.276
22-032-WR-4		18130.6	7194.06	2069.32		1136.7 *	24324.3			302.815	54.0124 *	306.069

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-032-SS-1	232.832			28.7523 *	82.2581			375.148			8.67494
22-032-WR5-A	215.415		5.47916 *	413.632	197.475			786.002	74.6785 *		13.0427
22-032-WR5-B	134.546			96.0561	172.176			557.942			10.9917
22-032-WR-1	145.078		7.71538 *		155.024			644.904			16.3401 *
22-032-WR-1-COMP	162.252			46.2198 *	134.738	111.247 *		868.658			17.2084
22-032-WR-2	207.619				149.665			981.028			18.523 *
22-032-WR-2-COMP	188.588			219.483	181.377			819.596			15.5415
22-032-WR-3	188.081				136.032	131.741 *		1061.59			23.4629 *
22-032-WR-4	177.071		11.6212 *	113.787	179.605			700.952			13.0049

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

MANTLE (EAST)
PA NO. 22-032

MDSL AMRB/PIONEER 4/9/93

AIMSS SCORESHEET

SITE NAME: MANTLE EAST
PA NUMBER: 22-032

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.027
6	GW - TARGETS	WELLS - 1 MI. x 2.5		22.5
7		WELLS - 1 TO 4 MI		28
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	50.5
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	20745

SURFACE WATER PATHWAY

11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	400
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	1.141
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	8215

AIR PATHWAY

25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.038
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	10
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	19

DIRECT CONTACT PATHWAY

36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		5
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	25
38		LIKELIHOOD SCORE	LINES 36 + 37C	25
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.034
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0

45 **TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE**
(LINES 10 + 24 + 35 + 44) / 100,000 **0.29**

SITE NAME: MANTLE EAST
PA NUMBER: 22-032

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		5
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

22-032, #13: WR-1; east site

22-032, #14: WR-3; east site

22-032, #15: WR-4; east site

22-032, #16: Dumps (west site) and Cataract Creek

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: CRYSTAL **PA#:** 22-073

Date: July 7, 1993 **Time:** 0830

Field Team Leader: Babits, Pioneer

Sampling Personnel: Lasher, Pioneer
Pierson, TD&H

Visitors: MSE
MT Tech

Weather/Seasonality Observations: Cool (40°F); cloudy and rainy; slight breeze; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #8,#9: WR-1, -2, -3; #10: Adit discharge entering Uncle Sam Gulch; #11: Adit and discharge; #12: WR-3. Video Tape No. 3

General Comments/Observations (not covered specifically in attached Inventory Forms): Site is having settling ponds built (est. 1994) for treatment of acid mine drainage under Department of Energy contract.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: May be possible to reprocess waste rock for lead; otherwise, fill in pits.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): CRYSTAL PA#: 22-073

Legal Description: T 7N ;R 5W ;Sec. 20 , NW1/4ALL1/4 ___1/4

County: JEFFERSON Mining District: BASIN/CATARACT

Latitude: N 46° 21' 01" Longitude: W 112° 15' 37"

Primary Drainage Basin and Code: Cataract Creek/10020006
Secondary Drainage Basin: Uncle Sam Gulch

USGS Quadrangle map name(s): Basin

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Lead, Zinc

Activity Status: Active___,Inactive/Exploration X ,Abandoned___.

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Delbert and Allan Bullock, Box 66, Basin, MT 59631. (406) 225-3260; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: The Sparkling Water mine is adjacent to this site.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7800' , Slope Up to 30° ,
Aspect South; West, WR-1, -2, and -3

Land use: Mining___, Recreational X , Residential___, Urban___, Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? 15 acres.
Dimensions:

Predominant vegetation types: Fir, grass

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is at headwaters of Uncle Sam Gulch, which enters Cataract Creek approx. 2.5 miles from site. The site is underlain by Butte quartz monzonite.

Mining/milling history, ore type/tenor, host rock, gangue: Estimated mine operation was from 1908 to the 1960's. Production from 1900 to 1963 was 21,000 to 22,000 tons of ore yielding 3,650 oz. Au, 338,300 oz. Ag, 300 tons Cu, 980 tons Pb, and 1,020 tons Zn. Minerals are galena, sphalerite, chalcopyrite, pyrite, and arsenopyrite. Gangue is quartz in altered country rock. Vein mineralization in a fault zone in Butte quartz monzonite.

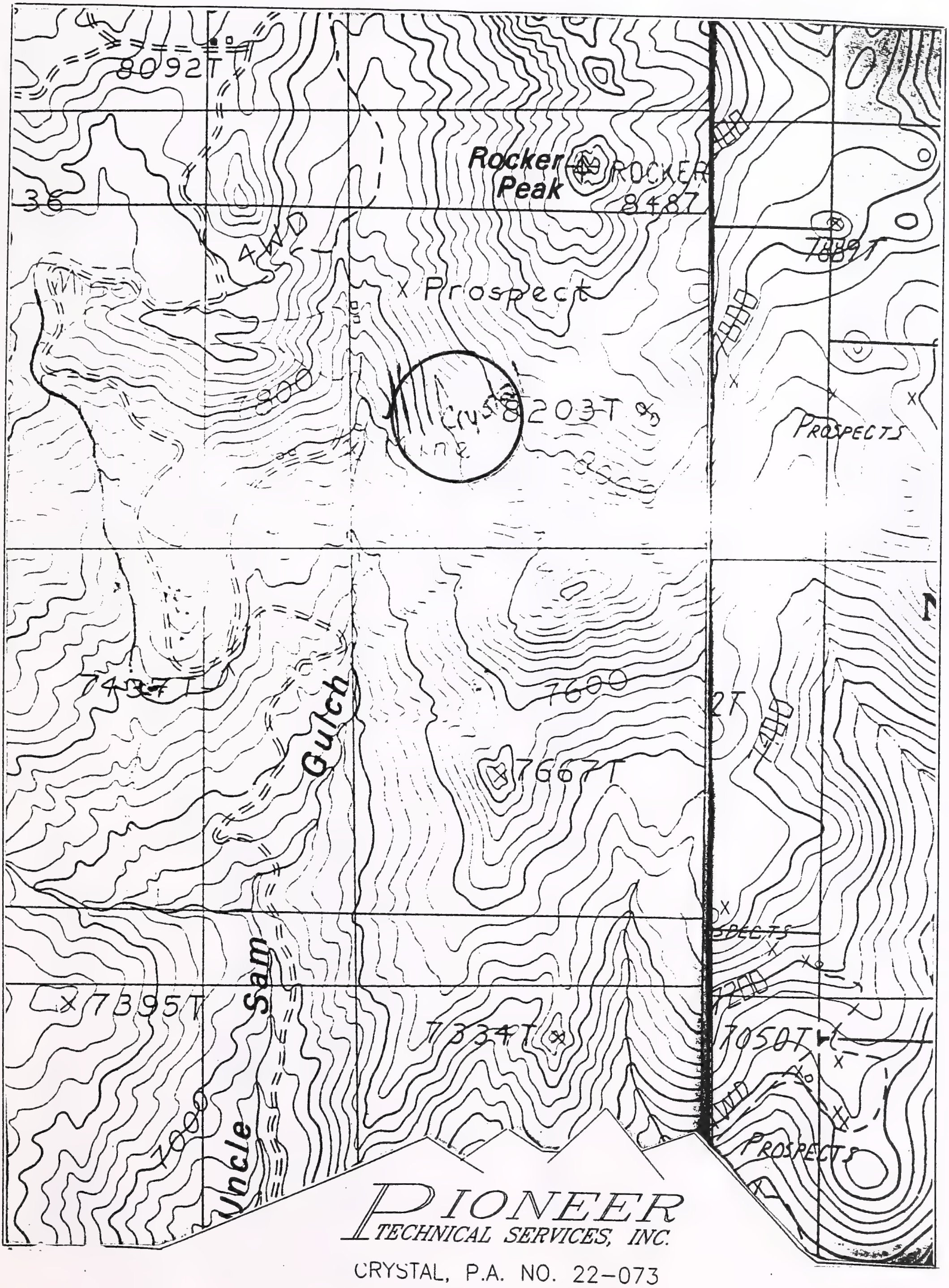
Mine Operation?
Shafts - Yes ___, No X, # ___, Comment
Adits - Yes X, No ___, # 2, Comment Open; 1 discharging
Pits - Yes X, No ___, # 3, Comment Large trenches
Placers - Yes ___, No X, # ___, Comment
Other - Yes ___, No X, # ___, Comment

Mill Operation? Yes ___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: N/A

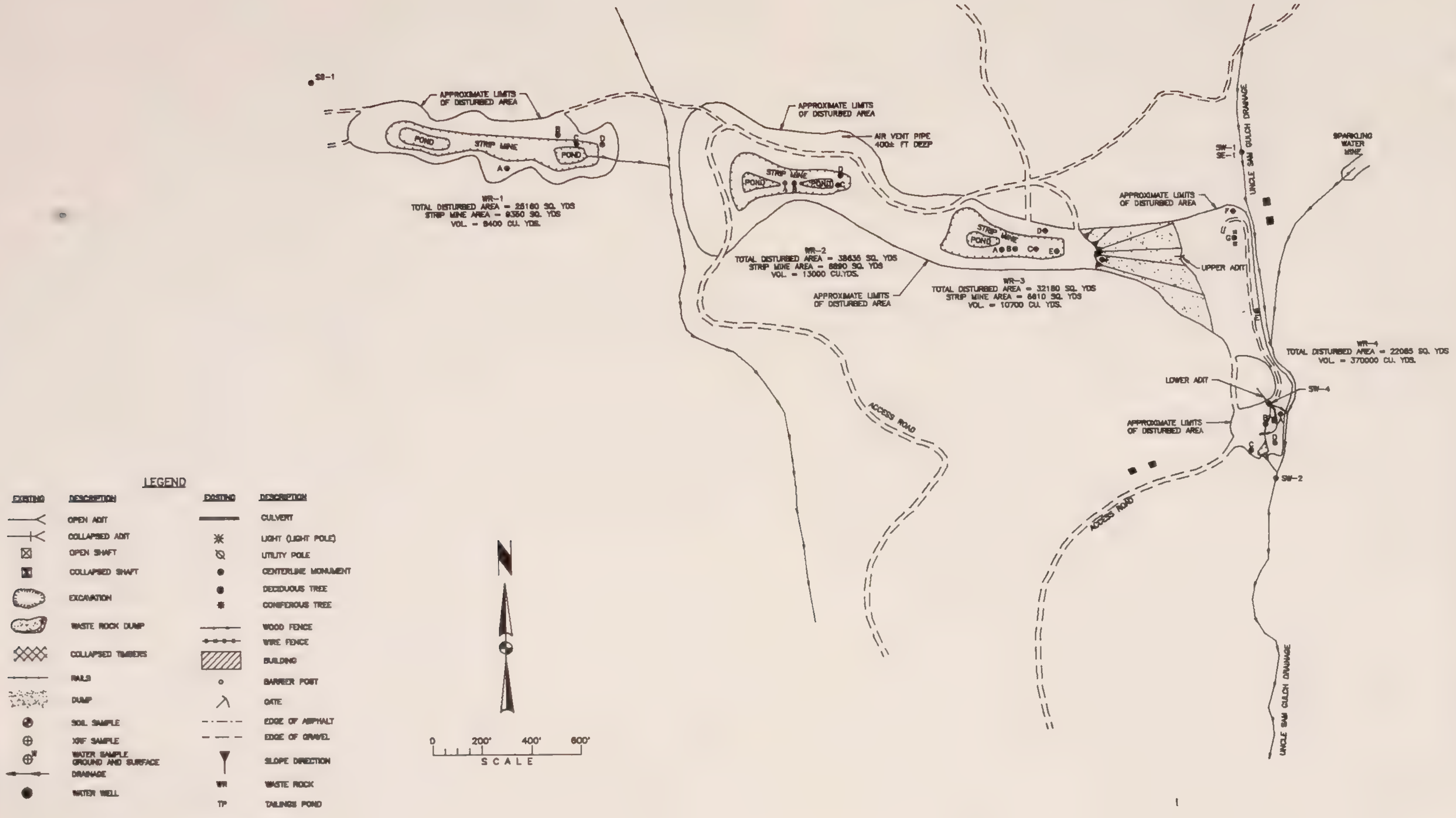
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A



PIONEER
TECHNICAL SERVICES, INC.

CRYSTAL, P.A. NO. 22-073

T07N, R05W, SECTION 19
SCALE: 1" = 1000'



DRAWN MWC DATE 10/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

CRYSTAL PA# 22-073
CATARACT DISTRICT JEFFERSON COUNTY

SHEET NO.

22-073.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	OTH	9,350	South side of western most trench	None	3.5 (D)	0.07	22-073-WR-1	07/07/93 1100	T-Metals, ABA
WR-1B	OTH		North side of western most trench	None	5.2 (D)	0.05			
WR-1C	OTH		North of east pond in western most trench	None	5.4 (D)	0.05	22-073-WR-2	07/07/93 1110	T-Metals, ABA
WR-1D	OTH		East end of western most trench	None	5.4 (D)	0.05			
WR-2A	OTH	13,000	Center of middle trench	None	5.2 (D)	0.06	22-073-WR-3	07/07/93 1115	T-Metals, ABA
WR-2B	OTH		Center of middle trench; east of WR-2A	None	5.8 (D)	0.08			
WR-2C	OTH		Southeast end of middle trench	None	5.9 (D)	0.06			
WR-2D	OTH		Northeast end of middle trench	None	5.4 (D)	0.07			
WR-3A	OTH	10,700	Middle of eastern most trench; south of pond	None	6.4 (D)	0.07	22-037-WR-4	07/07/93 1120	T-Metals, ABA
WR-3B	OTH		Middle of eastern most trench; east of WR-3A	None	6.4 (D)	0.05			
WR-3C	OTH		North side of eastern most trench	None	4.6 (D)	0.06			
WR-3D	OTH		South side of eastern most trench	None	6.2 (D)	0.06	N/A	N/A	XRF Analysis
WR-3E	OTH		East end of eastern most trench	None	5.4 (D)	0.08			
WR-3F	OTH		Dump at east end of eastern most trench	None	4.6 (D)	0.06			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-073-WR-1 is composite of WR-1A and -1B. 22-073-WR-2 is composite of WR-1C and -1D. 22-073-WR-3 is composite of WR-2A through -2D. 22-073-WR-4 is composite of WR-3A through -3C, and -3E and -3F.

*Continued on next page

SOURCE INVENTORY FORM (Cont'd)

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)[*]	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-4A	OTH	370,000	East of discharging adit	None	6.0 (D)	0.10	22-073-WR-5	07/07/93 1140	T-Metals, ABA
WR-4B	OTH		West of discharging adit	None	5.2 (D)	0.08	22-073-WR-6	07/07/93 1155	T-Metals, ABA
WR-4C	OTH		Southwest of discharging adit	None	5.0 (D)	0.08			
WR-4D	OTH		Southeast of discharging adit	None	4.5 (D)	0.06			
WR-4E	OTH		Next to Uncle Sam Gulch from upper adit	None	5.2 (D)	0.08			
WR-4F	OTH		North end of dump	None	5.5 (D)	0.07	22-073-WR-7	07/07/93 1145	T-Metals, ABA
WR-4G	OTH		Middle of road made of waste rock near upper adit	None	< 3.5 (D)	0.06			
SS-1	BKGRND	N/A	Background soil 200' upgradient of trench (WR-1)	None	N/A	N/A	22-073-SS-1	07/07/93 1100	T-Metals

[*] D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-073-WR-5 is WR-4A. 22-073-WR-6 is composite of WR-4B through -4E. 22-073-WR-7 is composite of WR-4F and -4G.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X, No ___, Number: 1 Identification: Lower adit

Filled shafts: Yes ___, No X, Number: ___ Identification: ___

Seeps/Springs: Yes X, No ___, Number: 1 Identification: At base of WR-3

Groundwater wells within 4 miles?: Yes X, No ___;
Number of well logs: 3

Distance to nearest well used for drinking? 2 miles

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite ___, Probable X, Possible ___, Unlikely ___.
Uncontained sources with elevated metal values. Large discharging adit with gpm reported by MSE, Inc., to be up to 50 gpm.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-4	AD	Adit discharge	25 gpm (E)	3.41	1500	489.9	6.5	0	N/A	22-073-SW-4	07/07/93 1230	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

*FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Uncle Sam Gulch

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes ___, No X, Name(s)/Description: ___

Waste materials within any floodplain: Yes X, No ___ Source ID(s): Waste rock is in Uncle Sam Gulch.

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? At headwaters, 1 cfs; at site, 7.5 cfs

High Flow: 50 cfs, Average Flow: 6 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; waste rock is in Uncle Sam Gulch.

Surface water draining onto or through waste sources: Yes X, No ___, Describe: Discharge from adit flows through waste rock.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Wetland, fishery, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___, Distance downstream (ft)? 13,150 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Uncle Sam Gulch is impacted (iron-stained and dead vegetation) all the way until its confluence with Cataract Creek. No mine sites appear to impact the gulch below Crystal.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Approx. 300 feet upgradient on Uncle Sam Gulch	9.41	150	211.7	8.6	2	1 cfs (M)	22-073-SW-1	07/07/93 1430	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Approx. 300 feet upgradient on Uncle Sam Gulch	N/A	N/A	N/A	N/A	N/A	N/A	22-073-SE-1	07/07/93 1430	T-Metals
SW-2	SW	Downgradient of adit discharge PPE in Uncle Sam Gulch	4.18	670	459.4	11.1	0	8 cfs (M)	22-073-SW-2	07/07/93 1310	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Downgradient of adit discharge PPE in Uncle Sam Gulch	N/A	N/A	N/A	N/A	N/A	N/A	22-073-SE-2	07/07/93 1310	T-Metals
SE-3	SE	In Uncle Sam Gulch prior to confluence with Cataract Creek	N/A	N/A	N/A	N/A	N/A	N/A	22-077-SE-3	07/07/93 1645	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): See Morning Glory site (22-077) for an Uncle Sam Gulch sediment sample prior to discharge to Cataract Creek.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides? (SO_3)

Presence of evaporative salt deposits? (ESD)

Discolored or turbid seepage? (SPG)

Presence of long filamentous algae in drainages, mosses in moist areas?

Presence of ferric hydroxide precipitates? (FEOX)

Presence of burned or stressed vegetation? (VEG)

pH ≤ 5.0 (pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 1 acre

Wetlands present: Yes___, No X , Describe:

Carbonate rocks/soils: Yes___, No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30 X ; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 2 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3; pH	Moist	84,150	84,150	Yes	Moderate/Low
WR-2	SO3	Moist	62,010	62,010	Yes	Moderate/Low
WR-3	SO3; pH	Moist	59,490	59,490	Yes	Moderate/Low
WR-4	SO3; pH	Moist	198,585	198,585	Yes	Moderate/Low
SW	FEOX	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X
Describe:

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments None

Evidence of recreational use on site: Yes___, No X, Describe:

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No X, Comment
Wilderness Area - Yes___, No X, Comment
T&E Species Habitat - Yes___, No X, Comment
Bat Habitat - Yes X, No___, Comment Adits

Primary Drainage X; Secondary Drainage___; No Information___:

Riparian Habitat Quality - High___, Medium X, Low___
Wetlands Frontage - High___, Medium___, Low X
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes X, No___, Number 2, types and locations:
Adits at WR-4

Hazardous structures: Yes X, No___, Number 2, types and locations:
Loadout and tipple

Unstable highwalls, pits, trenches, slopes: Yes___, No X, Number____, types and locations:

Unstable waste piles, impoundments, undercut banks: Yes____, No X, Number____, types and locations:

Fire and/or Explosion hazards: Yes___, No X, Explain:

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Roberts, Steven A., Geologist, Brief Report on the Crystal Claim Group, Jefferson County, Montana, April 27, 1976.

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LABORATORY ANALYTICAL DATA

CRYSTAL
PA NO. 22-073

Crystal PA# 22-073
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – BABITS
INVESTIGATION DATE: 07/07/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-073-SE-1	434 J	19.3	8.1	1.8	1.4	27.4	4820	0.048 J	224	3	513 J	10	1110	NR
22-073-SE-2	1900 J	49.4	1	7.7	2.1	203	17600	0.057 J	758	4	999 J	57	487	NR
22-073-WR-1	2510 J	94	18.4	16.5	6.3	292	38100	0.059 J	1310	13	862 J	23	3260	NR
22-073-WR-2	524 J	39.6	0.6 U	17.6	5.2	337	38000	0.062 J	2640	10	559 J	7	479	NR
22-073-WR-3	449 J	59	17.8	8.4	1.7	376	13800	0.031 J	743	7	3570 J	32	2230	NR
22-073-WR-4	3880 J	341	2.1	7.6	3.4	410	23600	0.062 J	1350	6	3350 J	65	783	NR
22-073-WR-5	7310 J	11.4	0.5 U	1.3	1 U	1250	65100	0.492 J	19.7	2	3090 J	73	290	NR
22-073-WR-6	458 J	45	2	5.4	2.4	88.5	10200	0.051 J	263	3	188 J	6	482	NR
22-073-WR-7	390 J	23.5	0.4 U	1.6	2	39.7	5580	0.107 J	140	3	339 J	9	103	NR
22-077-SE-3	539	57	13.6	20.2	2.6 J	848 J	11600	0.033 J	1020 J	5	387 JX	15 J	937 JX	NR
BACKGROUND	140 J	193	0.7 U	9.4	14.9	71.2	21200	0.114 J	1930	11	56 J	5 U	159	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-073-WR-1	0.61	19.1	2.13	−16.	0.29	0.16	0.16	5	−2.87
22-073-WR-2	0.01	0.31	4.83	4.52	0.01	<0.01	<0.01	0	4.83
22-073-WR-3	0.63	19.7	7.36	−12.	<0.01	0.37	0.39	11.6	−4.2
22-073-WR-4	0.25	7.81	5.47	−2.3	0.24	<0.01	0.01	0	5.47
22-073-WR-5	3.75	117	−9.8	−127	0.35	2.47	0.93	77.2	−87
22-073-WR-6	0.01	0.31	6.65	6.34	<0.01	0.01	<0.01	0.31	6.34
22-073-WR-7	0.08	2.5	−0.8	−3.3	<0.01	0.02	0.1	0.62	−1.51

WATER MATRIX ANALYSES

Metals in Water   Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-073-SW-1	5.59	6.4	2.57 U	9.7 U	6.83 U	10.8 J	228 J	0.038 U	15.8 JX	12.7 U	5.14 JX	30.7 U	38.4 J	9.5
22-073-SW-2	724	10.4	131	52.7	8.4 J	3130 J	9340 J	0.038 U	2100 JX	12.7 U	46.8 JX	30.7 U	11500 J	46.6
22-073-SW-4	9910	29.8	1010	363	12.5 J	26700 J	112000 J	0.038 U	13600 JX	59.1	425 JX	172	84300 J	224

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Wet Chemistry   Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-073-SW-1	46	< 5.0	< 10	< 0.05	NR
22-073-SW-2	191	< 5.0	97	< 0.05	NR
22-073-SW-4	1230	< 5.0	710	< 0.05	NR

LEGEND

SE1 – Approx. 300' upgradient on Uncle Sam Gulch
SE2 – Downgradient of adit discharge PPE in Uncle Sam Gulch.
22-077-SE3 – Uncle Sam Gulch; prior to discharge.
WR1 – Composite of subsamples WR1A and 1B.
WR2 – Composite of subsamples WR1C and 1D.
WR3 – Composite of subsamples WR2A, 2B, 2C, and 2D.
WR4 – Composite of subsamples WR3A, 3B, 3C, 3E, and 3F.
WR5 – Sample of subsample WR4A.

WR6 – Composite of subsamples WR4B, 4C, 4D, and 4
WR7 – Composite of subsamples WR4F and 4G.
BACKGROUND – From Crystal Mine. (22-073-SS-1).

SW1 – Same as SE1.
SW2 – Same as SE2.
SW4 – Adit discharge.

XRF ANALYSIS RESULTS

CRYSTAL
PA NO. 22-073

Mine Name: Crystal PA# 22-073
XRF Field Analyses
Results in PPM
Page 1 of 2.

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-073-SS-1		12367	7659.35	2650.88		1248.64	24014.5			139.927 *	50.5613 *	213.425
22-073-WR1-A		28485.8	7082.25	2233.15		1262.98	40881.4		384.936	1395.26	2445.68	192.959
22-073-WR1-B			7983.01	2113.04		930.734 *	34657.6		143.214 *	428.794	1680.02	240.378
22-073-WR1-C			3443.13	2679.88		1694.35	42703.7			375.205	141.336	131.496
22-073-WR1-D			4277.5	3064.65		4271.59	39964.5		454.113	584.855	419.626	154.441
22-073-WR2-A			8310.52	3088.62		2720.16	37937.7		505.927	2315.22	520.183	228.54
22-073-WR2-B			4401.91	1669.93			21671.5		219.393	535.905	520.399	153.066
22-073-WR2-C			13175.1	1476.84		537.668 *	15827.8			67.6455 *		348.323
22-073-WR2-D			5339.97	1368.26	155.23 *	754.7 *	16869.2			88.6714 *	36.2859	191.882
22-073-WR3-A			4385.86	2141.6		1619.45	39058.4		559.145	1278.75	4570.18	148.222
22-073-WR3-B			5973.7	1847.74		1561.32	33247.1		347.382	1116.31	2694.47	302.682
22-073-WR3-C			2328.85	2609.4			20381		73.0161 *	153.65 *	5647.12	83.9849
22-073-WR3-D			4188.24	1826.49		4827.27	31180.8		90.0018 *	1038.07	761.013	183.812
22-073-WR3-E			2970.45	1295.81			35369.7		1001.73	385.907	3166.5	158.332
22-073-WR3-F			7979.09	1803.41		2523.67	32042.1		252.678	677.218	2585.05	162.014
22-073-WR4-A			1373.63	425.366			71137.8		955.632	290.504	9243.45	29.2717 *
22-073-WR4-B			9900.11	1927.27		1561.38	18240.7		59.7901 *	1137.45	249.025	285.36
22-073-WR4-C			7644.91	2137.83		476.18 *	30813.7		165.195 *	487.277	2726.62	221.874
22-073-WR4-D			13704.1	1874		625.909 *	20770.7		69.4559 *	258.505	461.065	258.176
22-073-WR4-E			2034.11	1189.08	132.875 *		24370.5		94.6954 *	449.125	567.605	69.7102
22-073-WR4-F			1678.08	673.298			12189.9		112.828 *	155.514	9802.61	34.1215
22-073-WR4-G			2800.63	1502.72			15481.1			286.36	889.066	92.1865
22-073-WR-1-COMP			9068.07	2368.65		1900.1	38397.7		233.212	741.09	1896.09	257.64
22-073-WR-2-COMP			3287.22	2670.99		3326.46	43698.3		164.051 *	415.816	369.512	159.765
22-073-WR-3-COMP			6222.12	1765.45		1461.8	26397.9		249.731	1361.46	500.178	194.4
22-073-WR-4-COMP			5264.84	2099.39		1574.29	40407.4		422.516	976.67	3231.26	209.365
22-073-WR-6-COMP			7425.86	1767.96		478.067 *	23511		59.961 *	555.424	905.253	193.18

Mine Name: Crystal PA# 22–073
XRF Field Analyses
Results in PPM
Page 2 of 2.

XRF SAMPLE ID	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22–073–SS–1	232.832			28.7523 *	82.2581			375.148			8.67494 *
22–073–WR1–A	173.226		7.26409 *	890.912	239.206		55.8414 *	385.692	100.521 *		10.4995 *
22–073–WR1–B	137.972		5.59335 *	284.111	168.098		52.6618 *	445.596	79.603 *		15.4611 *
22–073–WR1–C	126.685			57.9728 *	220.689		52.3577 *	453.518			13.044 *
22–073–WR1–D	158.686		7.6512 *	782.833	192.232		55.1559 *	479.759	86.7385 *		10.5106 *
22–073–WR2–A	171.531		10.1443 *	794.571	181.7		182.646	551.155	109.781 *		25.2562 *
22–073–WR2–B	86.1335		4.67976 *	1328.28	207.615			427.255	81.1069 *		23.74 *
22–073–WR2–C	159.05			33.421 *	111.676			812.859			15.7687 *
22–073–WR2–D	134.491			19.6567 *	204.829			868.014			16.5641 *
22–073–WR3–A	185.025		10.2993 *	2899.78	225.046		272.376	433.825	138.012 *		25.2833 *
22–073–WR3–B	141.944		8.74682 *	2427.12	162.691		140.013 *	580.815	101.503 *		32.1366 *
22–073–WR3–C	181.266		8.76161 *	2701.06	382.983		274.525	634.856	93.7841 *		24.7957 *
22–073–WR3–D	156.377		8.4054 *	1037.94	305.844		70.6759 *	371.067	142.611 *		20.8736 *
22–073–WR3–E	151.627		19.3564 *	2933.91	226.109		99.6245 *	331.407	111.16 *		
22–073–WR3–F	195.369			1750.78	284.152		209.631	479.794	125.282 *		30.0615 *
22–073–WR4–A	133.237		29.8636	4061.55	255.088	161.487 *	232.457	91.4719	142.205 *		20.4949 *
22–073–WR4–B	129.938			148.35	198.357			490.556			26.1565 *
22–073–WR4–C	144.545			528.633	195.797		80.1099 *	493.973	92.4432 *		18.9532 *
22–073–WR4–D	160.656			120.909	207.023			700.958			15.7794 *
22–073–WR4–E	143.364			97.4763	235.152			297.557	80.9198 *		17.9947 *
22–073–WR4–F	97.2307		12.6994 *	6858.3	286.301		397.97	101.47			48.6035 *
22–073–WR4–G	151.245			514.052	253.877		55.8134 *	420.564			16.967 *
22–073–WR–1–COMP	188.122			554.254	186.675			447.344	136.111 *		17.2622 *
22–073–WR–2–COMP	167.18			326.994	211.597	117.763 *	52.3667 *	460.703			19.2295 *
22–073–WR–3–COMP	134.923			824.268	199.202		73.455 *	614.853	74.6126 *		13.8677 *
22–073–WR–4–COMP	151.006		9.75358 *	2443.43	227.594	134.731 *	184.252	567.326	122.871 *		25.1837 *
22–073–WR–6–COMP	143.943			136.736	182.738			462.619			

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

CRYSTAL
PA NO. 22-073

MDSL AMRB/PIONEER 4/9/93

AIMSS SCORESHEET

SITE NAME: CRYSTAL MINE
PA NUMBER: 22-073

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	879.309
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		3
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	3.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	1055171
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	920.597
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		13
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	31
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	22830806
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		15
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	75
27		LIKELIHOOD SCORE	LINES 25 + 26C	75
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.182
29	AIR - TARGETS	POPULATION - 4 MILES		10
30		NEAREST RESIDENCE		0
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	10
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	2387
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.041
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**238.88**

SITE NAME: CRYSTAL MINE
PA NUMBER: 22-073

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	100
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	180
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

SUMMARY OF HISTORICAL ANALYTICAL DATA FROM OTHER SOURCES

4

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 STATE HEALTH DEPT.        WATER QUALITY BUREAU           HELENA, MONTANA  59601

           STATE  MONTANA                                  COUNTY  JEFFERSON
      LAT.-LONG.  462016N 1121545W           SAMPLE LOCATION   7N  5W 20CC
    STATION CODE                             ANALYSIS NUMBER  77W1336
    DATE SAMPLED  07-07-77                     DRAINAGE BASIN  041E -BOULDER R.
    TIME SAMPLED  1445                         WATER FLOW RATE     1.0 CFS(E)
  METHOD SAMPLED  GRAB                 FLOW MEASUREMENT METHOD
   SAMPLE SOURCE  STREAM              ALTITUDE OF LAND SURFACE
       WATER USE  UNKNOWN            TOTAL WELL DEPTH BELOW LS
      AQUIFER(S)                      SWL ABOVE(+) OR BELOW LS
      SAMPLED BY  WQBH               SAMPLE DEPTH BELOW SURFACE

          SAMPLING SITE: UNCLE SAM GULCH

                      MG/L     MEQ/L                           MG/L      MEQ/L
    CALCIUM (CA)                              BICARBONATE(HCO3)
  MAGNESIUM (MG)                                CARBONATE (CO3)
     SODIUM (NA)                                 CHLORIDE  (CL)
   POTASSIUM  (K)                                 SULFATE (SO4)  132.        2.748
       IRON (FE)                                 FLUORIDE   (F)
  MANGANESE (MN)                             PHOSPHATE(PO4 AS P)
   ALUMINUM (AL)                               NO3+NO2(TOT AS N)

                     ------     ------                         -------     -----
      SUM CATIONS     0.0        0.0              SUM ANIONS   132.000     2.748

                LABORATORY PH     3.70     TOT HARDNESS(MG/L-CACO3)
  FIELD WATER TEMPERATURE (C)             TOT ALKALINITY(MG/L-CACO3)
   SUM-DISS. IONS MEAS.(MG/L)             LABORATORY TURBIDITY (JTU)
   LAB CONDUCTIVITY-UMHOS-25C   416.8        SODIUM ADSORPTION RATIO

                     A D D I T I O N A L   P A R A M E T E R S
   SEDIMENT,TOT,SUSP (MG/L)<   13.4      ACIDITY,TOT (MG/L-CACO3)     63.
         IRON,TR (MG/L AS FE)   3.0             ZINC,TR (MG/L AS ZN)  17.
   MANGANESE,TR(MG/L AS MN)    3.4             LEAD,TR (MG/L AS PB)     .08
   CADMIUM, TR (MG/L AS CD)     .18         SILVER, TR (MG/L AS AG)   < 0.05
    ARSENIC,TR (MG/L AS AS)     .23       MERCURY, TR (MG/L AS HG)   < 0.0002
      COPPER,TR (MG/L AS CU)    3.1

   REMARKS: BOULDER BATHOLITH 0662
                                                 HG EXCEEDED HOLDING TIME
   EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
   ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
   (M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   SAMPLE NO 05      ; SAMPLER    DP    HANDLING 2100    ANALYST   ME    LAB  BH
   COMPLETED 10-04-17  COMPUTER RUN 10/13/77  DATA 0975/PROG 0876 FUND 0662
   STND DEV. ION BALANCE   9.99     CA   MG   NA    K    CL   SO4  HCO3  CO3  NO3
   SEGMENT       MPDES              0.0  0.0  0.0  0.0  0.0100.0  0.0  0.0  0.C
   CALC. MEQ/L= INSUFFICIENT DATA                                         77W133
```

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E HEALTH DEPT.        WATER QUALITY BUREAU        HELENA, MONTANA  59620

      STATE  MONTANA                                     COUNTY  JEFFERSON
  LAT.-LONG.  462047N 1121536W            SAMPLE LOCATION  07N 05W 20BCA
STATION CODE                              ANALYSIS NUMBER  86W1566
DATE SAMPLED  06-23-86                      DRAINAGE BASIN  041E -BOULDER R.
TIME SAMPLED                               WATER FLOW RATE
THOD SAMPLED  GRAB                  FLOW MEASUREMENT METHOD
AMPLE SOURCE  STREAM               ALTITUDE OF LAND SURFACE
   WATER USE  STOCK               TOTAL WELL DEPTH BELOW LS
 AQUIFER(S)                         SWL ABOVE(+) OR BELOW LS
 SAMPLED BY   DSC                SAMPLE DEPTH BELOW SURFACE

      SAMPLING SITE:  UNCLE SAM GULCH BELOW CRYSTAL MINE

                     MG/L      MEQ/L                                 MG/L      MEQ/L
CALCIUM (CA)                              BICARBONATE(HCO3)
GNESIUM (MG)                                CARBONATE (CO3)
 SODIUM (NA)                                 CHLORIDE  (CL)
TASSIUM  (K)                                  SULFATE (SO4)
                                             FLUORIDE   (F)
                                       PHOSPHATE(PO4 AS P)
                                         NO3+NO2 (TOT AS N)

                   -------    -------                          -------    -------
 SUM CATIONS        0.0       0.000            SUM ANIONS        0.0       0.000

            LABORATORY PH                  TOT HARDNESS(MG/L-CACO3)
ELD WATER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)
UM-DISS. IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (NTU)
AB CONDUCTIVITY-UMHOS-25C                    SODIUM ADSORPTION RATIO

                ADDITIONAL  PARAMETERS
ARSENIC,TR (MG/L AS AS)       .36✓     CADMIUM, TR (MG/L AS CD)       .10✓
 COPPER,TR (MG/L AS CU)      2.32✓          ZINC,TR (MG/L AS ZN)     9.38✓
   IRON,TR (MG/L AS FE)      4.66✓     MANGANESE,TR(MG/L AS MN)      1.86✓




EMARKS: AMR

OTES: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVALENTS/L  UG/L=MICROGRAMS/L
LL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
=TOTAL RECOVERABLE (M)=MEASURED (R)=REPORTED (E)=ESTIMATED M=METERS
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
AMPLE NO-          SAMPLER-BAM  HANDLING-11     ANALYST-LAB  LAB-        SCAN-NO
OMPLETED-06/30/86  COMPUTER RUN-07/28/86  DATA-0684/PGM-0984  FUND-5501
TND DEV. ION BALANCE=           CA   MG   NA    K   CL  SO4  HCO3  CO3  NO3
PDES-                          0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
ALC. MEQ/L= SC N/A, NO CALC.                                        86W1566
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STATE HEALTH DEPT.          WATER QUALITY BUREAU            HELENA, MONTANA  59601

          STATE  MONTANA                                   COUNTY  JEFFERSON
     LAT.-LONG.  462054N 1121526W                 SAMPLE LOCATION   7N  5W 208AC
   STATION CODE                                   ANALYSIS NUMBER  77W1333
   DATE SAMPLED  07-07-77                          DRAINAGE BASIN  041E -BOULDER R.
   TIME SAMPLED  1345                             WATER FLOW RATE       5.0 GPM(E)
 METHOD SAMPLED  GRAB                      FLOW MEASUREMENT METHOD
  SAMPLE SOURCE  MINE DRAIN               ALTITUDE OF LAND SURFACE
      WATER USE  UNUSED                 TOTAL WELL DEPTH BELOW LS
     AQUIFER(S)                            SWL ABOVE(+) OR BELOW LS
     SAMPLED BY  WQBH                  SAMPLE DEPTH BELOW SURFACE

        SAMPLING SITE: WATER FROM CRYSTAL MINE DRIFT

                      MG/L      MEQ/L                                MG/L       MEQ/L
   CALCIUM (CA)                             BICARBONATE(HCO3)
 MAGNESIUM (MG)                               CARBONATE (CO3)
    SODIUM (NA)                                CHLORIDE  (CL)
 POTASSIUM  (K)                                 SULFATE (SO4)   260.          5.413
      IRON (FE)                                FLUORIDE   (F)
 MANGANESE (MN)      Al w/                 PHOSPHATE(PO4 AS P)
  ALUMINUM (AL)      1.008                  NO3+NO2(TOT AS N)
  HYDROGEN (H+)       1.27      1.259
                    ------     ------                           -------      ------
   SUM CATIONS       1.269      1.259              SUM ANIONS   260.000       5.413

              LABORATORY PH       2.90    TOT HARDNESS(MG/L-CACO3)
 FIELD WATER TEMPERATURE (C)              TOT ALKALINITY(MG/L-CACO3)
  SUM-DISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (JTU)
  LAB CONDUCTIVITY-UMHOS-25C  1383.0         SODIUM ADSORPTION RATIO

              A D D I T I O N A L   P A R A M E T E R S
  SEDIMENT,TOT,SUSP (MG/L)   101.6      ACIDITY,TOT (MG/L-CACO3)    425.
      IRON,TR (MG/L AS FE)   100.           ZINC,TR (MG/L AS ZN)     87.
  MANGANESE,TR(MG/L AS MN)    16.           LEAD,TR (MG/L AS PB)      .38
  ARSENIC(TR(MG/L AS AS)      6.1       MERCURY                  <.0002
  SILVER                      <.05

  REMARKS: BOULDER BATHOLITH 0662
                                         HG EXCEEDED HOLDING TIME
  EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
  ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDE
  (M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
  SAMPLE NO 02        SAMPLER    DP    HANDLING 2100    ANALYST   ME    LAB  WQB
  COMPLETED 10-04-77  COMPUTER RUN 10/13/77  DATA 0975/PROG 0876 FUND 0662
  STND DEV. ION BALANCE  9.99      CA    MG    NA    K    CL   SO4   HCO3  CO3   NO
  SEGMENT       MPDES              0.0   0.0   0.0   0.0  0.0100.0  0.0   0.0   0.
  CALC. MEQ/L= INSUFFICIENT DATA                                              77W13
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STATE HEALTH DEPT. WATER QUALITY BUREAU HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	JEFFERSON
LAT.-LONG.	462054N 1121536W	SAMPLE LOCATION	7N 5W 20BBD
STATION CODE		ANALYSIS NUMBER	77W1332
DATE SAMPLED	07-07-77	DRAINAGE BASIN	041E -BOULDER R.
TIME SAMPLED	1330	WATER FLOW RATE	15.0 GPM(E)
METHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	
SAMPLE SOURCE	MINE DRAIN	ALTITUDE OF LAND SURFACE	
WATER USE	UNUSED	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: ~~CRYSTAL MINE SEEP~~ WATER NEAR ACTIVE PART OF MINE

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
MAGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
POTASSIUM (K)			SULFATE (SO4)	4.6	0.096
IRON (FE)			FLUORIDE (F)		
MANGANESE (MN)			PHOSPHATE(PO4 AS P)		
ALUMINUM (AL)			NO3+NO2(TOT AS N)		
SUM CATIONS	0.0	0.0	SUM ANIONS	4.600	0.096

LABORATORY PH	7.20	TOT HARDNESS(MG/L-CACO3)	
FIELD WATER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	
SUM-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (JTU)	
LAB CONDUCTIVITY-UMHOS-25C	160.4	SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS

SEDIMENT,TOT,SUSP (MG/L)<	13.9	COPPER,TR (MG/L AS CU)	.03
IRON,TR (MG/L AS FE)	.35	ZINC,TR (MG/L AS ZN)	.08
MANGANESE,TR(MG/L AS MN)	.23	LEAD,TR (MG/L AS PB)	< 0.05
CADMIUM, TR (MG/L AS CD)	< 0.005	SILVER, TR (MG/L AS AG)	< 0.05
ARSENIC,TR (MG/L AS AS)	.027	MERCURY, TR (MG/L AS HG)	< 0.0002

REMARKS: BOULDER BATHOLITH 0662 , SEEP BELOW ACTIVE PART OF MINE
HG EXCEEDED HOLDING TIME

EXPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

SAMPLE NO 01 SAMPLER DP HANDLING 2100 ANALYST ME LAB WQBH
COMPLETED 10-04-77 COMPUTER RUN 10/13/77 DATA 0975/PROG 0876 FUND 0662

		CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
STND DEV. ION BALANCE	1.06									
SEGMENT	MPDES	0.0	0.0	0.0	0.0	0.010	0.0	0.0	0.0	0.0

CALC. MEQ/L= INSUFFICIENT DATA 77W1332

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STATE HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

         STATE  MONTANA                                 COUNTY  JEFFERSON
    LAT.-LONG.  462054N 1121536W              SAMPLE LOCATION   7N   5W 20BB[illegible] 01
  STATION CODE                                ANALYSIS NUMBER  77W1334
  DATE SAMPLED  07-07-77                        DRAINAGE BASIN  041E -BOULDER R.
  TIME SAMPLED  1400                           WATER FLOW RATE         .3 CFS(E)
METHOD SAMPLED  GRAB                   FLOW MEASUREMENT METHOD
 SAMPLE SOURCE  STREAM                ALTITUDE OF LAND SURFACE
     WATER USE  UNUSED              TOTAL WELL DEPTH BELOW LS
    AQUIFER(S)                        SWL ABOVE(+) OR BELOW LS
    SAMPLED BY  WQBH                 SAMPLE DEPTH BELOW SURFACE

         SAMPLING SITE: WATER BELOW MINE DUMP

                      MG/L      MEQ/L                              MG/L      MEQ/L
  CALCIUM (CA)                            BICARBONATE(HCO3)
MAGNESIUM (MG)                              CARBONATE (CO3)
   SODIUM (NA)                               CHLORIDE  (CL)
POTASSIUM  (K)                                SULFATE (SO4)     78.         1.624
     IRON (FE)                               FLUORIDE   (F)
MANGANESE (MN)                         PHOSPHATE(PO4 AS P)
 ALUMINUM (AL)                            NO3+NO2(TOT AS N)

                     ------    ------                          ------     ------
   SUM CATIONS         0.0       0.0              SUM ANIONS   78.000      1.624

                LABORATORY PH       4.30     TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (JTU)
 LAB CONDUCTIVITY-UMHOS-25C   243.8            SODIUM ADSORPTION RATIO

                    ADDITIONAL   PARAMETERS
 SEDIMENT,TOT,SUSP (MG/L)<   13.2       ACIDITY,TOT (MG/L-CACO3)      90.
     IRON,TR (MG/L AS FE)    1.7            ZINC,TR (MG/L AS ZN)       9.6
 MANGANESE,TR(MG/L AS MN)    2.7            LEAD,TR (MG/L AS PB)       .08
 CADMIUM, TR (MG/L AS CD)     .08       SILVER, TR (MG/L AS AG)    < 0.05
  ARSENIC,TR (MG/L AS AS)     .050     MERCURY, TR (MG/L AS HG)    < 0.0002
   COPPER,TR (MG/L AS CU)    1.5




REMARKS: BOULDER BATHOLITH 0662    THIS WATER FLOWS THRU MINE DUMP
                                           HG EXCEEDED HOLDING TIME
EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO 03          SAMPLER   DP    HANDLING 2100    ANALYST   ME   LAB  WQBH
COMPLETED 10-04-77  COMPUTER RUN 10/13/77  DATA 0975/PROG 0876 FUND 0662
STND DEV. ION BALANCE   9.99    CA    MG    NA    K    CL  SO4  HCO3  CO3  NO3
SEGMENT        MPDES           0.0   0.0   0.0   0.0  0.0100.0   0.0   0.0  0.0
CALC. MEQ/L= INSUFFICIENT DATA                                           77W133
```

CRYSTAL

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q637	CUSRB20	0.00	U		0.00	U		1.74	B		7.25	B		0.00	U		0.00	U	
92Q638	CUSS10L	0.00	U		0.00	U		3.54	B		25.03	B		10.57	B		0.00	U	
92Q639	CUSS20L	0.00	U		11.59	B		3546.00			6824.00			6.52	B		0.00	U	
92Q640	CUSS30L	0.00	U		3.23	B		90.62			2756.00			1.63	B		0.00	U	
92Q641	CUSS40L	0.63	U		0.00	U		10.09	B		59.64			4.90	B		0.00	U	
92Q642	CUSS50L	0.00	U		0.00	U		38.08	B		498.42			4.76	B		0.00	U	
92Q643	CUSS60L	0.00	U		0.00	U		38.09	B		511.40			3.88	B		0.00	U	
TOTAL RECOVERABLE METALS: (ppb)																			
92Q958	CUSS30L	0.00	U		4.91	B		451.54			3523.00			63.79			0.00	U	
92Q959	CUSS40L	0.00	U		0.00	U		7.79	B		49.38			3.68	B		0.00	U	
92Q960	CUSS50L	0.00	U		0.00	U		72.74			520.38			12.70	B		0.00	U	
92Q961	CUSS60L	0.00	U		0.00	U		71.35			1175.00			12.61	B		0.00	U	

MORNING GLORY

Site visited, but no sample results available.

CHAMPION MINE

DISSOLVED METALS: (ppb)

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
92Q819	DCHS10M	0.00	U		9.05	B		0.00	U		0.00	U		0.82	B		0.00	U	

MAMMOTH TAILINGS

LAB ID	SAMPLE ID	Cr	Crc	Crq	Ni	Nic	Niq	Cu	Cuc	Cuq	Zn	Znc	Znq	As	Asc	Asq	Ag	Agc	Agq
DISSOLVED METALS: (ppb)																			
92Q1482	JBSTRIP	-1.76	U		-1.18	U		-0.74	U		1.91	U		-0.88	U		-1.14	U	
92Q1514	JBSB10L	-1.12	U		0.13	U		1.56	U		63.63			-0.55	U		-1.14	U	
TOTAL RECOVERABLE METALS: (ppb)																			
92Q1515	JBSB10L	0.00	U		0.00	U		0.00	U		0.00	U		0.00	U		0.00	U	
92Q1515	JBSB10L	0.00	U		0.00	U		0.00	U		5.65	B		1.55	B		0.00	U	

NONPAREIL MINE

CRYSTAL

LAB ID	SAMPLE ID	Cd	Cdc	Cdq	Ba	Bac	Baq	Pb	Pbc	Pbq	Hg	Hgc	Hgq
92Q637	CUSRB20	0.63	B		6.69	B		0.00	U				
92Q638	CUSS10L	0.67	B		17.38	B		1.29	B				
92Q639	CUSS20L	242.32			23.08	B		89.75					
92Q640	CUSS30L	44.57			27.83	B		1.47	B				
92Q641	CUSS40L	0.91	B		27.32	B		0.96	B				
92Q642	CUSS50L	7.09	B		28.35	B		1.40	B				
92Q643	CUSS60L	7.44	B		23.05	B		1.34	B				
TOTAL RECOVERABLE METALS: (ppb)													
92Q958	CUSS30L	46.23			31.74	B		11.26					
92Q959	CUSS40L	0.00	U		21.40	B		0.00	U				
92Q960	CUSS50L	5.91	B		21.73	B		0.90	B		0.37		
92Q961	CUSS60L	5.90	B		23.95	B		1.00	B				

MORNING GLORY

Site visited, but no sample

CHAMPION MINE

DISSOLVED METALS: (ppb)

92Q819	DCHS10M	0.88	B		19.74	B		0.00	U				

MAMMOTH TAILINGS

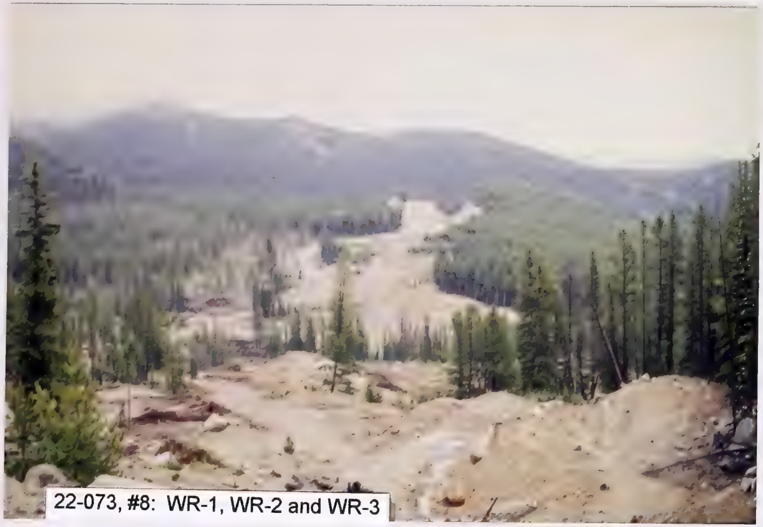
DISSOLVED METALS: (ppb)

92Q1482	JBSTRIP	-0.92	U		-1.52	U		-1.16	U				
92Q1514	JBSB10L	0.59	U		16.21	B		-0.63	U				

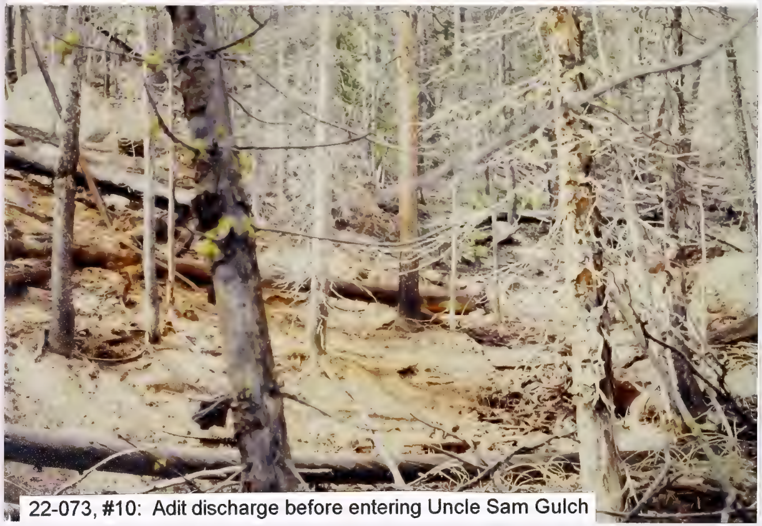
TOTAL RECOVERABLE METALS: (ppb)

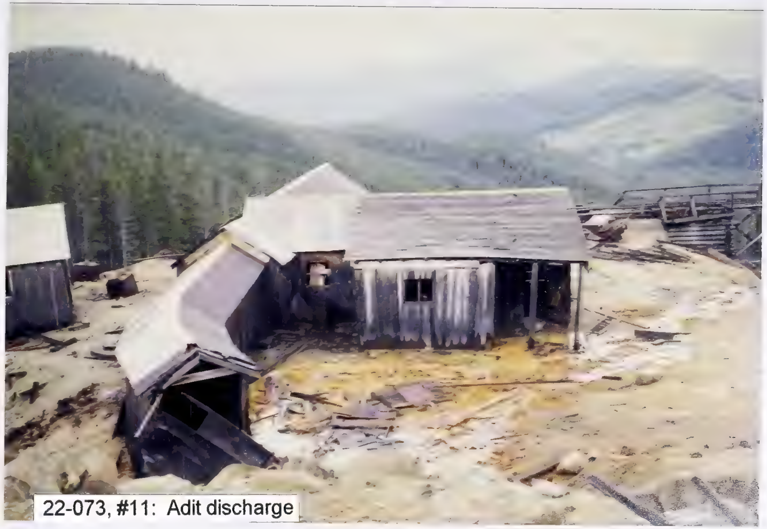
92Q1515	JBSB10L	0.00	U		17.10	B		0.00	U		0.07	B	
92Q1515	JBSB10L	0.00	U		14.93	B		0.00	U		0.07	B	

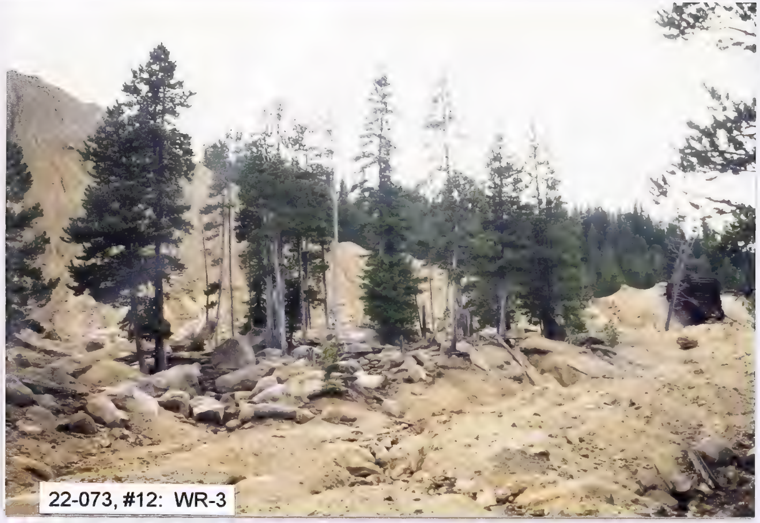
NONPAREIL MINE


22-073, #8: WR-1, WR-2 and WR-3

22-073, #9: WR-1, WR-2 and WR-3


22-073, #10: Adit discharge before entering Uncle Sam Gulch


22-073, #11: Adit discharge



22-073, #12: WR-3

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: EVA MAY **PA#:** 22-075

Date: July 7, 1993 **Time:** 0800-1247

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Cloudy and overcast; occasional drizzle; cool; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** #22: WR-1 looking south; #23: WR-1 looking west; #24: Adit #1 vicinity; #25: WR-1 from toe; #26,#27: WR-2; #28: Adit #2; #29: SE-1 sample location and tailings; #30: Tailings; #31: Mill; #32: SE-2 sample location. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** Access to site was by truck. Waste rock dump #2 has been disturbed fairly recently.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Isolate tailings from Cataract Creek; grade, amend and revegetate mine wastes.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): EVA MAY PA#: 22-075

Legal Description: T 7N ;R 5W ;Sec. 22 , NW1/4 NW1/4 ___ 1/4

County: JEFFERSON Mining District: CATARACT

Latitude: N 46° 21' 00" Longitude: W 112° 13' 20"

Primary Drainage Basin and Code: Cataract Creek/10020006
Secondary Drainage Basin: Cataract Creek

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Lead, Copper, Gold, Silver

Activity Status: Active ___, Inactive/Exploration X , Abandoned ___.

Ownership status: Known Y X N ___; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): Reno Parker, P.O. Box 246, Cut Bank, MT 59427. (406) 873-5206; Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Located above the Hattie Ferguson and Morning Glory mine sites. Eva May mine is at the eastern end of Eva May/Crystal/Bullion vein, which has a strike length of 3 1/2 miles.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 6650' , Slope 8°-30° ,
Aspect Northwest

Land use: Mining X , Recreational X , Residential ___, Urban ___,
Agricultural X , Other(Specify) ___

Area of disturbed/unvegetated lands? 7 acres.
Dimensions: ___

Predominant vegetation types: Lodgepole pine, grasses, raspberry bushes, aspen, alder, Engleman spruce, willow

Access: roads - good ___, fair X , 4wd X , trail ___.
Other logistical considerations (proximity to other sites). ___

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). The site is underlain by Butte quartz monzonite cut by tourmaline bearing aplite. The Eva May lies on the west side of Cataract Creek, with the tailings lying within the creek floodplain. Cataract Creek flows south away from the site. Cataract Creek flows into the Boulder River 6 to 7 miles below the site.

Mining/milling history, ore type/tenor, host rock, gangue: The site had a 50-ton mill from 1900 to 1910. The mine reopened in 1952. Between 1905 and 1949 inclusive, the mine produced 206 tons of ore containing 8 oz. Au, 2,506 oz. Ag, 6,035 lbs. Cu, and 7,106 lbs. Pb. Some of the ore contains a considerable amount of black tourmaline. Metallic minerals in the ore are chalcopyrite, galena, sphalerite, tetrahedrite, and iron pyrite. Stringers of ore encountered contain chiefly galena and sphalerite in a white quartz gangue.

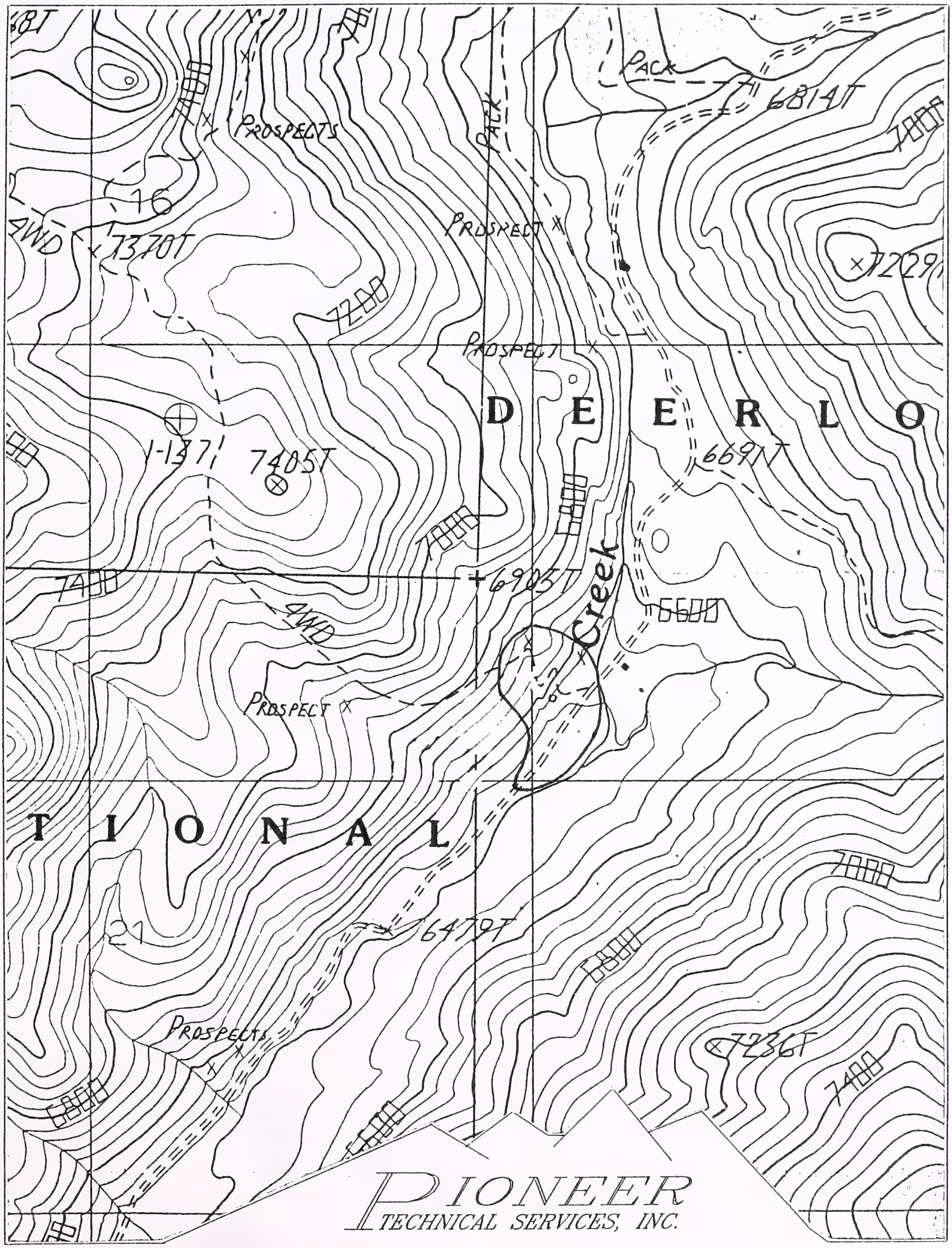
Mine Operation?
Shafts - Yes___, No X, # ___, Comment___
Adits - Yes X, No___, # 2, Comment Caved; 1 discharging
Pits - Yes___, No X, # ___, Comment___
Placers - Yes___, No X, # ___, Comment___
Other - Yes___, No X, # ___, Comment___

Mill Operation? Yes X, No___. If yes answer the next three questions:

Period(s) of Operation: 1905 to 1949; 1952 to Unknown

Origin of Ore Milled - Custom Mill___ Dedicated Mill X; Number and names of mines that supplied mill feed: Unknown

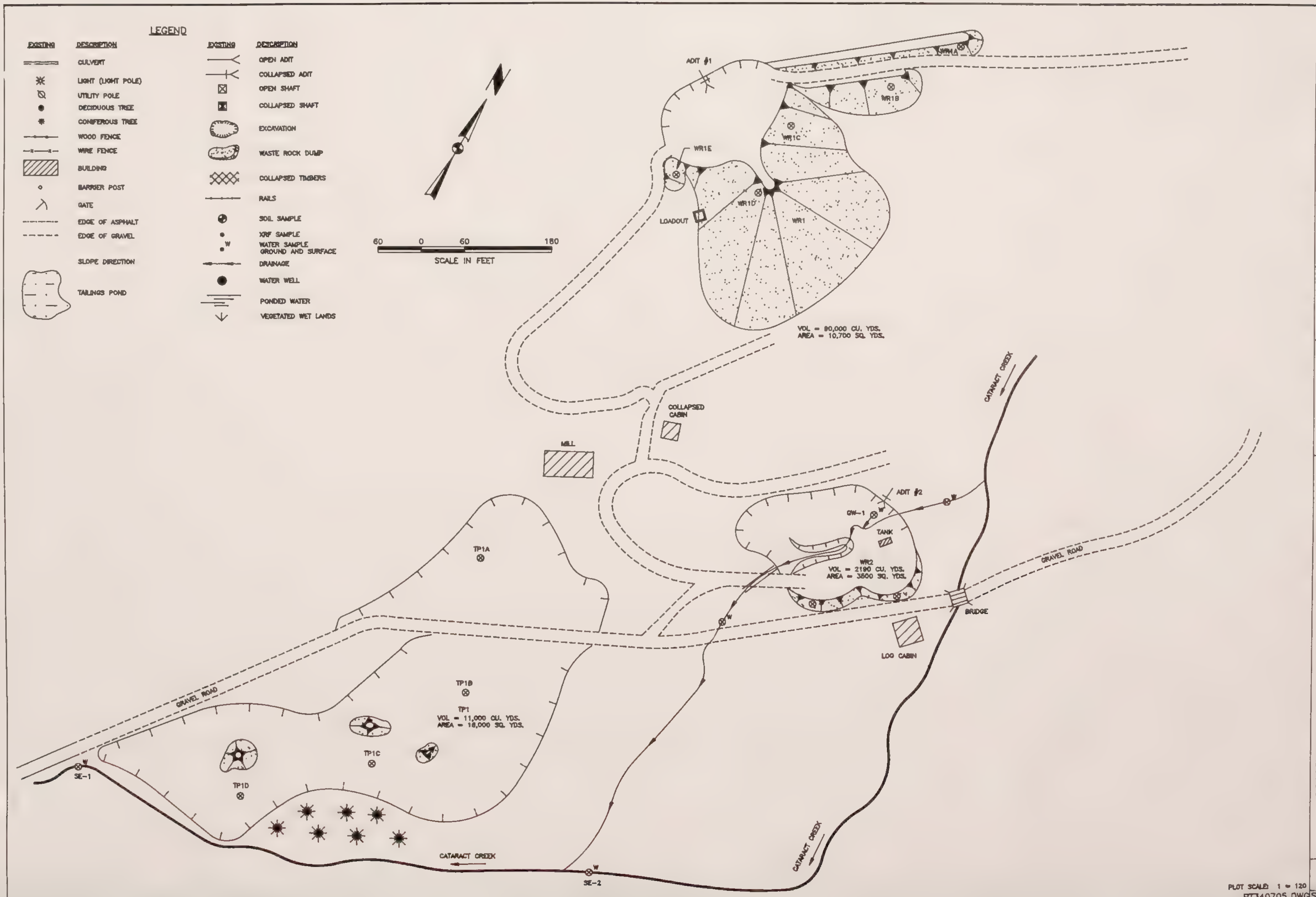
Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
Large gravity concentrator



EVA MAY, P.A. NO. 22–075

T07N, R05W, SECTION 22

SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

EVA MAY PA# 22-075
CATARACT DISTRICT JEFFERSON COUNTY

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

TDH

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS—BOZEMAN—KALISPELL MONTANA
SPOKANE WASHINGTON

DRAWN MWC DATE REV 1/11/95
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

SHEET NO. 1
1 SHEETS

PLOT SCALE: 1 = 120
PT340705.DWG

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Coarse brown sand on eastern and northern ends upgradient; medium brown sand with silt on the western, lower end.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Average depth appeared to be less than 2 feet, with no stratification. The majority of the tailings have been scraped up into piles.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): No impoundment remains.

Comments on potential for mitigation: Amend and revegetate; remove some tailings from the Cataract Creek floodplain, stabilize the channel on the southwest end of the impoundment. Install runon/runoff controls.

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	90,000	Upper large waste rock dump; on nose of northeast lobe	None	6.9 (D)	0.05	N/A	N/A	XRF Analysis
WR-1B	WR		Upper large waste rock dump; on southeast side of northeast lobe	None	3.7 (D)	0.03	22-075-WR-1	07/07/93 1238	T-Metals, ABA
WR-1C	WR		Upper large waste rock dump; on northeast side of southeast lobe	None	< 3.5 (D)	0.04			
WR-1D	WR		Upper large waste rock dump; on southwest side of southeast lobe	None	6.0 (D)	0.025	N/A	N/A	XRF Analysis
WR-1E	WR		Upper large waste rock dump; on east side of south lobe	None	< 3.5 (D)	0.04	N/A	N/A	XRF Analysis
WR-2A	WR	2,190	Lower small dump associated with Adit #2; northeast part, south face	None	< 3.5 (D)	0.05	22-075-WR-2	07/07/93 1245	T-Metals, ABA
WR-2B	WR		Lower small dump associated with Adit #2; southeast end, east face	None	4.8 (D)	0.04	N/A	N/A	XRF Analysis
TP-1A	TAIL	11,000	North side of road near mill; 0-1.2', coarse brown sand	Partially by road	6.9 (D)	0.03	22-075-TP-1	07/07/93 1420	T-Metals
TP-1B	TAIL		South side of road, eastern end; 0-1.5', coarse sand	None	7.0 (D)	0.065			
TP-1C	TAIL		Center of south side area; 0-1.2', dark brown sand	None	6.8 (D)	0.04			
TP-1D-A	TAIL		West end of south side; 0-1', dark brown silty sand	None	6.6 (D)	0.035			
TP-1D-B	TAIL		West end of south side; 1'-2', brown medium sand	None	7.0 (D)	0.045	N/A	N/A	XRF Analysis

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-075-WR-1 is composite of WR-1B and -1C. 22-074-WR-2 is a grab of WR-2A. 22-075-TP-1 is composite of TP-1A through -1C, and TP-1D-A. Background sample for this site is from the Morning Glory site (22-077).

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No___, Number: 1 Identification: Adit #2

Filled shafts: Yes___, No X , Number:____ Identification:____________

Seeps/Springs: Yes___, No X , Number:____ Identification:____________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 10

Distance to nearest well used for drinking? Approximately 2.5 miles

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible X , Unlikely____.
Elevated metal values in tailings and waste rock dumps; tailings ar possibly in contact with groundwater.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
GW-1	AD	Discharge from Adit #2	5 gpm (E)	6.67	355	0.75	7.7	125	N/A	22-075-GW-1	07/07/93 1030	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Cataract Creek and small diversion ditch that originates upstream of the site and flows through WR-2 before re-entering Cataract Creek

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes X, No ___, Name(s)/Description: Discharge from Adit #2

Waste materials within any floodplain: Yes X, No ___ Source ID(s): Tailings

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? ___
High Flow: 200 cfs, Average Flow: 20 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; tailings are in Cataract Creek and waste rock dumps are at least 300 feet away from Cataract Creek.

Surface water draining onto or through waste sources: Yes X, No ___,
Describe: Adit discharge and diversion ditch from Cataract Creek flow through WR-2.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Possible irrigation, fishery; Boulder River has fishery, recreation, agriculture, residential, and possible irrigation.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___, Distance downstream (ft)? ___ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Tailings in sediment bed load; multiple sources.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Flow above Adit #2	7.01	169	267	7.2	NM	9 gpm (E)	N/A	N/A	N/A
SW-2	SW	Flow below Adit #2	6.47	352	195	7.2	NM	13 gpm (E)	N/A	N/A	N/A
SE-1	SE	Downstream Cataract Creek	6.81	133.9	209	7.6	NM	30 cfs (E)	22-075-SE-1	07/07/93 1145	T-Metals
SE-2	SE	Upstream Cataract Creek	7.19	134.6	216	7.7	NM	30 cfs (E)	22-075-SE-2	07/07/93 1200	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No surface water taken from Cataract Creek due to very high dilution rates. NM = Not Measured.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Relatively broad stream valley for approx. 1/2 mile down from site; greater than 20 acres

Wetlands present: Yes___, No_X_, Describe:

Carbonate rocks/soils: Yes___, No_X_, Describe: None observed

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 200 feet to recreational cabin

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Belanger

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	SO3; FEOX; pH	Dry	96,300	96,300	Yes	Low
WR-2	SO3; FEOX; pH	Partial	31,500	25,200	Yes	Low
TP-1	FEOX	Dry	149,400	149,400	Yes	Moderate
Adit #2	FEOX; Algae	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes X , No_____, Describe: Recreational cabin within 200 feet

Population within 1 mile: 1-10 X ; 10-30___; 30-100___; 100-300___; 300-1,000____; 1,000-3,000____; 3,000-10,000____; 10,000 or greater____; Comments____

Evidence of recreational use on site: Yes X , No___, Describe: Off-road vehicle tracks

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No X , Comment____
Wilderness Area - Yes___, No X , Comment____
T&E Species Habitat - Yes___, No X , Comment____
Bat Habitat - Yes___, No X , Comment____

Primary Drainage___; Secondary Drainage X ; No Information___:

Riparian Habitat Quality - High___, Medium X , Low___
Wetlands Frontage - High___, Medium___, Low X
Fisheries Habitat and Species Classification - 4
Sport Fishery Classification - 4

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No X , Number____, types and locations:___

Hazardous structures: Yes X , No___, Number 2 , types and locations: WR-1 loadout structure and mill

Unstable highwalls, pits, trenches, slopes: Yes___, No X , Number____, types and locations:____

Unstable waste piles, impoundments, undercut banks: Yes X , No____, Number 1 , types and locations: Cataract Creek is eroding bank on southwest end of tailings pond area.

Fire and/or Explosion hazards: Yes___, No X , Explain:____

Bibliography

MBMG, Eva May Mine and Tailings, Jefferson County, Form 39, 1966, 1968, 1970-1971.

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MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin No. 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960, p. 29.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for Eva May, Prepared by Northern Engineering and Testing, October 16, 1987.

USGS, Geology and Mineral Deposits, Jefferson City Quadrangle, Montana, Professional Paper 428, Author Unknown, 1963, p. 91.

USGS, Topographic Map, Mount Thompson, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

EVA MAY
PA NO. 22-075

Eva May PA# 22-075
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 07/07/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-075-SE-1	49	33.9	0.8	2.1	3.2 J	30.2 J	5940	0.036 J	291 J	3	87 JX	11 J	174 J	NR
22-075-SE-2	8	25.3	0.6 U	3	4.2 J	9.4 J	5870	0.022 J	240 J	3 U	14 JX	7 UJ	75 J	NR
22-075-TP-1	1300	170	2.8	3	4.7 J	206 J	22300	0.082 J	160 J	4	1450 JX	70 J	420 J	NR
22-075-WR-1	384	31.6	0.7	7.9	1.2 UJ	357 J	29900	0.585 J	102 J	2 U	1270 JX	165 J	60 J	NR
22-075-WR-2	14700	4.2	11.2	1.5 U	1 UJ	56.5 J	14200	0.199 J	9.4 J	2 U	5970 JX	114 J	1660 J	NR
BACKGROUND	140 J	193	0.7 U	9.4	14.9	71.2	21200	0.114 J	1930	11	56 J	5 U	159	< 1.227

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-075-TP-1	0.23	7.19	-0.2	-7.4	0.2	0.01	0.02	0.31	-0.52
22-075-WR-1DUP	2.63	82.2	-3	-85	2.49	<0.01	0.15	0	-3.02
22-075-WR-1	2.63	82.2	-3.5	-86	2.49	<0.01	0.14	0	-3.52
22-075-WR-2DUP	2.59	80.9	-3.7	-85	0.61	1.15	0.83	35.9	-39.6
22-075-WR-2	2.58	80.6	-3.9	-85	0.57	1.18	0.83	36.9	-40.8

Cation/Exchange Capacity

FIELD ID	milliequivalents/100g
22-075-TP-1	6.17

Mechanical Analysis and % Coarse Material

FIELD ID	% CLAY	% SAND	% SILT	% COARSE MATERIAL (>2mm)
22-075-TP-1	2	82	16	0

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-075-GW-1	65.9 J	132	5.93	9.7 U	6.83 U	67.2 J	1750	0.230 J	1300	12.7 U	11.7 J	30.7 U	1490	178

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-075-GW-1	260	< 5.0	72	< 0.05	NR

LEGEND

SE1 - Downstream Cataract Creek.
SE2 - Upstream Cataract Creek.
TP1 - Composite of subsample TP1A, 1B, 1C, and 1D-A.
WR1 - Composite of subsamples WR1B and 1C.
WR2 - Sample of the WR2A subsample.
BACKGROUND - From the Crystal Mine (22-073-SS-1).
WR1DUP - Duplicate of the 22-075-WR-1 sample.
WR2DUP - Duplicate of the 22-075-WR-2 sample.
GW1 - Discharge from adit #2.

XRF ANALYSIS RESULTS

EVA MAY
PA NO. 22-075

Mine Name: Eva May PA# 22-075
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-075-TP1D-A		13906.2	7849.48	2435.36		987.791 *	39747.4		189.743	287.78	888.398	350.617
22-075-TP1D-B		20645.7	7441.23	966.545	146.876 *	457.772 *	14092		57.8493 *	147.764	35.3035 *	365.084
22-075-TP1-A		16722.4	6515.08	1502.34			33727.3		231.584	279.473	1235.97	396.21
22-075-TP1-B		14748.7	5951.6	1526.09			42453.8		80.5381 *	137.083	714.277	346.861
22-075-TP1-C		9387.65	2638.95	568.656			44880.4		458.894	371.283	6579.07	161.01
22-075-TP-1-COMP		12196.6	5805.86	1463.27		603.534 *	39722.2		239.53	410.405	1888.38	330.292
22-075-WR1-A		23683.5	17059	1762.83		824.766 *	21789.6			92.0967 *	57.5066 *	376.825
22-075-WR1-B		38495.8	10538.9	1297.9		372.313 *	52446		352.418	106.192 *	577.896	51.0638
22-075-WR1-C		33923.3	13847.5	1543.04		409.347 *	43579.7		546.09	120.683 *	645.597	97.0145
22-075-WR1-D		40506.2	24410	1246.76		6232.15	17526.7		68.6517 *	95.6053 *	83.3926 *	86.217
22-075-WR1-E		19487.2	8967.62	558.655		529.159 *	27026.1		1588.07	501.858	215.818 *	27.5417
22-075-WR2-A		16291.7	1048.28	119.129 *			21376.6		96.0971 *	2198.33	16273.1	17.5238 *
22-075-WR2-B		31367.6	15136.2	2364.02		1411.38	21107.3		98.0163 *	347.39	93.6195 *	149.757
22-075-WR-1-COMP		26242.2	12331	998.341		310.457 *	35227.3		335.576	100.441 *	432.536	69.2194

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-075-TP1D-A	233.086			62.7276 *	175.371			577.753		12.3736 *	21.4453 *
22-075-TP1D-B	139.267			113.039	161.838			696.761			9.30742 *
22-075-TP1-A	111.703		12.0977 *	1810.62	174.856		195.28	783.929	88.2287 *		20.1608 *
22-075-TP1-B	131.706			603.75	173.259		114.453 *	676.566			17.3143 *
22-075-TP1-C	105.051		17.8599 *	4293.27	153.341		336.812	907.82	149.626 *		23.2166 *
22-075-TP-1-COMP	132.683		7.84424 *	1127.93	154.51		166.033 *	713.186			16.4109 *
22-075-WR1-A	141.79				178.856			530.405		13.6516 *	17.8528 *
22-075-WR1-B	122.202		31.8222	642.504	316.128		165.53 *	72.7162 *	147.987 *		19.3933 *
22-075-WR1-C	113.913		12.2387 *	1251.59	294.511		769.147	380.905	189.325 *		64.5555
22-075-WR1-D	128.51		42.5926	22.67 *	305.043			177.091		16.7061 *	13.8623 *
22-075-WR1-E	25.906		46.4172	6666.18	262.435		415.021	342.576	411.515		157.281
22-075-WR2-A	38.7268		24.5582	5860.29	115.719		248.246	64.4504 *	137.754 *		
22-075-WR2-B	172.43		5.77956 *	170.291	266.79			449.523		15.0379 *	17.853 *
22-075-WR-1-COMP	90.6675		18.6797	832.922	258.935		390.339	194.622	96.7284 *		47.3153

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

EVA MAY
PA NO. 22-075

AIMSS SCORESHEET

SITE NAME: EVA MAY
PA NUMBER: 22-075

GROUNDWATER PATHWAY

LINE NO.				
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	95.763
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		10
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	10.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	383052

SURFACE WATER PATHWAY

LINE NO.				
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	101.816
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	8
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	570170

AIR PATHWAY

LINE NO.				
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	200
27		LIKELIHOOD SCORE	LINES 25 + 26C	200
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	5.060
29	AIR - TARGETS	POPULATION - 4 MILES		1
30		NEAREST RESIDENCE		10
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	21
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	21252

DIRECT CONTACT PATHWAY

LINE NO.				
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		250
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	650
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4.843
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		10
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	13
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	40923

45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000	**10.15**

SITE NAME: EVA MAY
PA NUMBER: 22-075

LINE NO.		SITE SAFETY		
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	80
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	80
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		10
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	13
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**20.80**

22-075, #23: WR-1, facing west

22-075, #24: Adit #1 (vicinity)

22-075, #25: WR-1 (from toe)

22-075, #26: WR-2

22-075, #27: WR-2

22-075, #28: Adit #2

22-075, #29: SE-1 sample location and tailings

22-075, #30: Tailings

22-075, #31: Mill

22-075, #32: SE-2 sample location

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: MORNING GLORY **PA#:** 22-077

Date: July 7, 1993 **Time:** 1315-1915

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer
Clark, Pioneer

Visitors: None

Weather/Seasonality Observations: Cloudy; cool; occasional rain; cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #33: Shaft (caved); #34: WR-1A and -1B area; #35: Mill, shed, and WR-1C; #36: Loadout, stream, and WR-2; #37: SE-1 upstream location. No video was taken.

General Comments/Observations (not covered specifically in attached Inventory Forms): Access to site by truck.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Isolate wastes from Cataract Creek; grade, amend, and revegetate.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): MORNING GLORY PA#: 22-077

Legal Description: T 7N ;R 5W ;Sec. 33 , E 1/4 NW1/4 ___1/4

County: JEFFERSON Mining District: CATARACT

Latitude: N 46° 19' 05" Longitude: W 112° 14' 35"

Primary Drainage Basin and Code: Boulder River/10020006
Secondary Drainage Basin: Cataract Creek

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Silver, Lead, Gold, Zinc

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Public
Owner, Agent, or Contact(Include address and phone when available): Deerlodge National Forest.

Relationship to other mines/sites in the area/district: Hattie Ferguson and Eva May sites are located upstream from this site.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 6400' , Slope 10°-36° ,
Aspect Northwest

Land use: Mining___, Recreational X , Residential___, Urban___,
Agricultural___, Other(Specify)

Area of disturbed/unvegetated lands? 5 acres.
Dimensions:

Predominant vegetation types: Lodgepole pine, juniper, spruce, willows

Access: roads - good___,poor___,4wd X ,trail___.
Other logistical considerations (proximity to other sites). Stream crossing is hazardous during high to moderate flows.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies in the perennial Cataract Creek floodplain; TP-1 is on the west side of the creek and waste rock is on the south side of the creek. Cataract Creek flows west and then south through the site to its confluence with Boulder River approximately three miles away. The site is underlain by grano-apalite.

Mining/milling history, ore type/tenor, host rock, gangue: From 1920 to 1957, inclusive production was 19,231 tons of ore yielding 2,484 oz. Au, 268,054 oz. Ag, 4,438 lbs. Cu, 83,140 lbs. Pb, and 7,793 lbs. Zn. Chief ore minerals in vein mineralization are fine-grained galena and dark spalerite in bands cutting through the altered wall rock. The ore minerals are accompanied by very fine-grained gray to coarse-grained milky quartz, locally abundant carbonate minerals, and some pyrite.

Mine Operation?

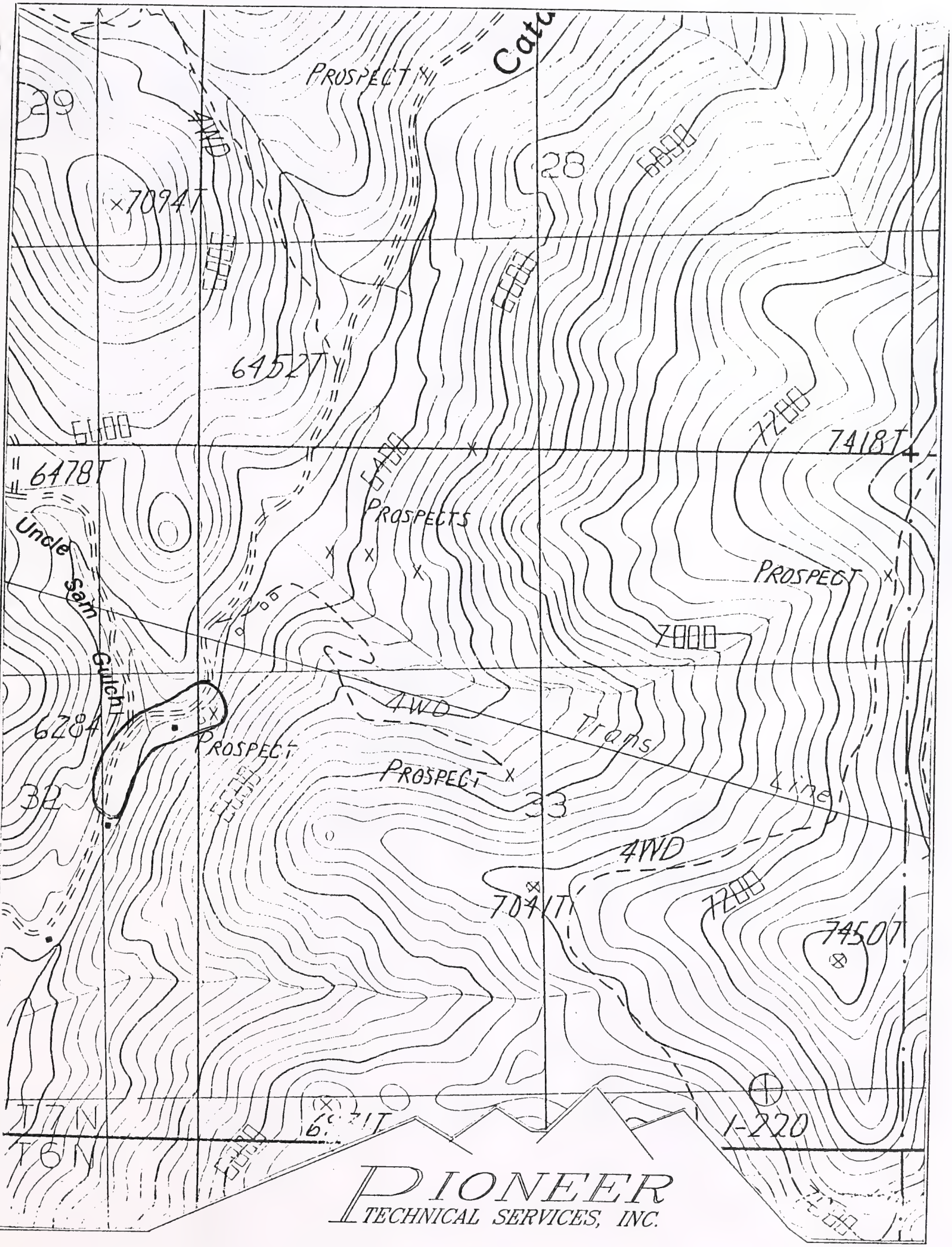
Shafts -	Yes X	No	# 1	Comment Caved
Adits -	Yes X	No	# 5	Comment Caved
Pits -	Yes	No X	#	Comment
Placers -	Yes	No X	#	Comment
Other -	Yes	No X	#	Comment

Mill Operation? Yes X , No ____. If yes answer the next three questions:

Period(s) of Operation: 1920 to 1957

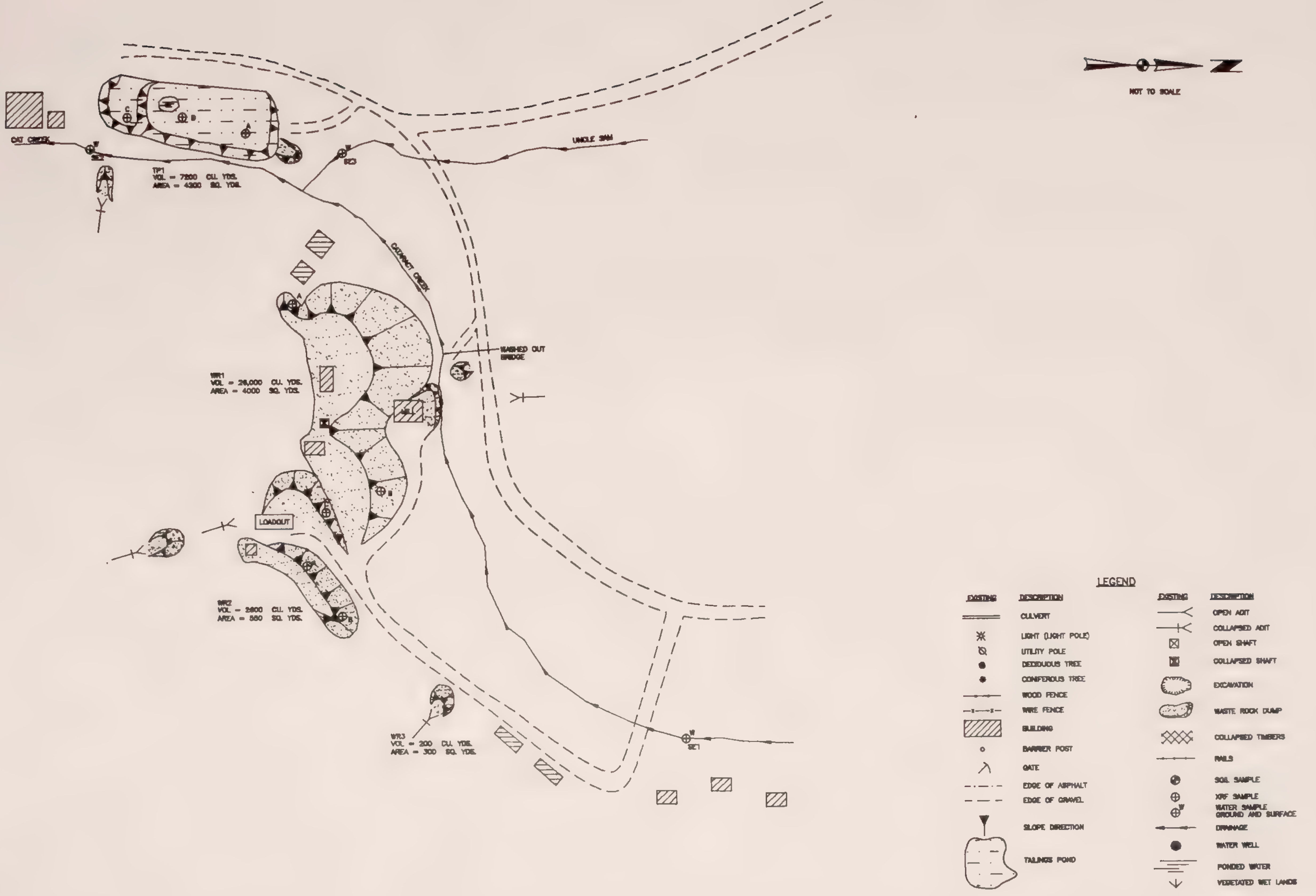
Origin of Ore Milled - Custom Mill ___ Dedicated Mill X ; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
50-ton floatation



PIONEER
TECHNICAL SERVICES, INC.

MORNING GLORY, P.A. NO. 22-077
T07N, R05W, SECTION 33
SCALE: 1" = 1000'



22-077.DWG

DRAWN CAL DATE 12/15/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

PIONEER

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

MORNING GLORY PA# 22-077
CATARACT DISTRICT JEFFERSON COUNTY

SHEET NO.

SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution(approximate % sand, silt, & clay): Approximately 65% fine to medium sand; 35% clay

Determine tailings impoundment depth and describe stratification of the tailings if observable(based on texture and color): The impoundment is approx. 8 to 9 feet deep. Oxidized zone, 2 to 4 feet deep, contains higher metals concentrations than through the underlying reduced zone.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Upper zone is mostly dry; lower (below 4 feet) is moist to wet.

Describe condition of the tailings impoundment(Note condition of dams or structures, location of breaches): The dike bordering Cataract Creek is currently in good condition.

Comments on potential for mitigation: Remove from the active floodplain.

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Belanger

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1A-A	TAIL	7,200	Northeast corner of TP-1; borehole, brown sand	Breached Impoundment	7.0 (D)	0.05	22-077-TP-1	07/07/93 1900	T-Metals
TP-1A-B	TAIL		Northeast corner of TP-1; 3.5'-7.5', borehole, moist brown sand	Breached Impoundment	6.3 (D)	0.04	22-077-TP-2	07/07/93 1910	T-Metals
TP-1A-C	TAIL		Northeast corner of TP-1; 7.5'-9.5', borehole, gray clay/sand	Breached Impoundment	5.7 (D)	0.04			
TP-1B-A	TAIL		South end of TP-1; 0'-4', tan silt/sand	Breached Impoundment	7.0 (D)	0.05			
TP-1B-B	TAIL		South end of TP-1; 4'-8', gray clay	Breached Impoundment	5.5 (D)	0.05			
TP-1B-C	TAIL		South end of TP-1; 8'-8.5', yellow sand	Breached Impoundment	5.3 (D)	0.04			
TP-1C-A	TAIL		Small, lowest pond; northeast corner; 0'-5'	Breached Impoundment	6.0 (D)	0.04	N/A	N/A	XRF Analysis
TP-1C-B	TAIL		Small, lowest pond; 5'-5.2', gray clay	Breached Impoundment	4.9 (D)	0.04	N/A	N/A	XRF Analysis
WR-1A	WR	26,000	Small west lobe on north side	None	5.2 (D)	0.04	22-077-WR-1	07/07/93 1845	T-Metals, ABA
WR-1B	WR		Large east lobe, east of mill, on top	None	5.4 (D)	0.05			
WR-1C	WR		Southeast side of WR-1	None	5.0 (D)	0.06			
WR-2A	WR	2,600	Waste rock south of road, on southwest end	None	5.6 (D)	0.05			
WR-2B	WR		Waste rock south of road, on northeast end	None	5.9 (D)	0.05			
WR-3A	WR	200	Northeast of WR-2, on northwest end	None	5.8 (D)	0.04	N/A	N/A	XRF Analysis
SS-1	BKGRND	N/A	Background Soil	N/A	N/A	N/A	22-077-SS-1	07/07/93 1700	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-077-TP-1 is composite of TP-1A-A and TP-1B-A. 22-077-TP-2 is composite of TP-1A-B and -1A-C, and TP-1B-B and -1B-C. 22-077-WR-1 is composite of WR-1A through -1C, and WR-2A and -2B.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:________

Filled shafts: Yes___, No_X_, Number:____ Identification:________

Seeps/Springs: Yes___, No_X_, Number:____ Identification:________

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs:_26___

Distance to nearest well used for drinking?_Approx. 3 miles________

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible_X__, Unlikely____.
Elevated metals in tailings (uncontained source) may be in contact with shallow aquifer.

Other observations/notes:_N/A________

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No___, Name(s): Cataract Creek

Dry streambeds: Yes____, No X , Name(s):

Other surface water: Yes X , No___, Name(s)/Description: Ponded water on the southwest quarter of TP-1. Uncle Sam Creek flows into Cataract Creek between the Waste Rock and Tailing impoundment.

Waste materials within any floodplain: Yes X , No___ Source ID(s): WR-1 and TP-1

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)?
High Flow: 200 cfs , Average Flow: 20 cfs

Distance between waste source(s) and nearest surface water body (ft)? 10 to 20 feet

Surface water draining onto or through waste sources: Yes X , No____,
Describe: Small precipitation runoff paths.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Agriculture, fishery, wetlands, possible irrigation and residential

Observed erosional/sedimentation/stream turbidity problems? Yes X , No_____, Distance downstream (ft)? >1000 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Combined impact with other mines in the drainage.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SE-1	SE	Cataract Creek upgradient	7.21	137.5	56	8.1	N/A	N/A	22-077-SE-1	07/07/93 1515	T-Metals
SE-2	SE	Cataract Creek below tailings	6.93	160.1	139	8.3	N/A	N/A	22-077-SE-2	07/07/93 1345	T-Metals
SE-3	SE	Uncle Sam Creek at confluence with Cataract Creek	6.51	198.1	160	8.9	N/A	N/A	22-077-SE-3	07/07/93 1645	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): No water samples taken due to dilution associated with high flows. Recommend low flow sampling of Cataract Creek in this area.

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approximately 5 acres downstream from tailings.

Wetlands present: Yes___, No_X_, Describe: None near the mine.

Carbonate rocks/soils: Yes_X_, No___, Describe: Geology reports indicate carbonates are abundant in the area.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000_X_; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments___

Nearest residence(ft or miles)? 100 feet below tailings (recreational)

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Belanger

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
TP-1	Low pH	Partial	37,800	26,460	Yes	Low/Moderate
WR-1	Low pH	Partial	36,000	30,600	Yes	Low
WR-2	Low pH	Dry	4,950	4,455	Yes	Low
WR-3	Low pH	Dry	2,700	2,430	Yes	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:____

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments_Recreational cabins______________________

Evidence of recreational use on site: Yes_X_, No___, Describe:_Litter;
vehicle tracks______________________________________

Accessibility - Fences, warning signs, closed roads?_Unrestricted___
____

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes___, No_X_, Comment__________
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium___, Low_X_
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number____, types and locations:___
Caved shaft______________________________________
____

Hazardous structures: Yes_X_, No___, Number_13_, types and locations:_
Mill, loadout, and numerous cabins______________________
____

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:______________________________
____
____

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____,
Number_1___, types and locations:_WR-1 side slope oversteepened and
eroded by Cataract Creek.___________________________
____

Fire and/or Explosion hazards: Yes_X_, No___, Explain:_Structures___
____
____

Bibliography

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MBMG, Well Log Database, September 8, 1993.

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MDSL/AMRB Files, Abandoned Mine Lands National Inventory, Phase II Problem Area Data Sheet for the Morning Glory Mine, Prepared by Mundie/Pederson, July 2, 1981.

MDSL/AMRB Files, Abandoned Mine Lands Portal Inventory for the Morning Glory, Prepared by Daphne Digrindakis, July 20, 1982.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Morning Glory, Prepared by Northern Engineering and Testing, October 21, 1987.

USGS, Geology and Mineral Deposits, Jefferson City Quadrangle, Montana, Professional Paper 428, Author Unknown, 1963, p. 88.

USGS, Topographic Map, Mount Thompson, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

MORNING GLORY
PA NO. 22-077

Morning Glory PA# 22−077
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER − BULLOCK
INVESTIGATION DATE: 07/07/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22−077−SE−1	9	19.6	0.6 U	2.5	1.6 UJ	19.3 J	3450	0.012 U	284 J	3 U	33 JX	7 UJ	135 JX	NR
22−077−SE−2	93	19.1	4.1	10.6	1.7 J	170 J	4960	0.01 U	617 J	2 U	91 JX	6 UJ	243 JX	NR
22−077−SE−3	539	57	13.6	20.2	2.6 J	848 J	11600	0.033 J	1020 J	5	387 JX	15 J	937 JX	NR
22−077−TP−1	2250	65.4	7.8	3.1	5.5 J	150 J	17400	0.248 J	5190 J	7	2070 JX	66 J	1140 JX	NR
22−077−TP−2	91	26.4	4.8	2.4	7.2 J	97.3 J	12900	0.188 J	22800 J	25	475 JX	6 J	1210 JX	NR
22−077−WR−1	48	22.1	1.5	11.9	7.8 J	33.6 J	19900	0.54 J	3830 J	12	88 JX	6 UJ	185 JX	NR
BACKGROUND	15	65.1	0.5 U	4	6.3 J	10.3 J	9160	0.01 J	344 J	6	11 JX	7 UJ	94 JX	NR

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22−077−SS−1	0.01	0.31	1.92	1.61	0.01	<0.01	<0.01	0	1.92
22−077−TP−1	0.19	5.94	74.6	68.7	0.08	0.08	0.03	2.5	72.1
22−077−TP−2	0.27	8.43	128	120	0.02	0.2	0.05	6.25	122
22−077−WR−1	0.73	22.8	73.3	50.5	0.12	0.47	0.14	14.7	58.6

LEGEND

SE1 − Cataract Creek upgradient.
SE2 − Cataract Creek downgradient.
SE3 − Uncle Sam Creek at confluence with Cataract Creek.
TP1 − Composite of subsamples TP1A−A and 1B−A.
TP2 − Composite of subsamples TP1A−B, 1A−C, 1B−B, and 1B−C.
WR1 − Composite of subsamples WR1A, 1B, 1C, 2A, and 2B.
BACKGROUND − From the Morning Glory Mine (22−077−SS−1).
SS1 − Same as the BACKGROUND sample.

XRF ANALYSIS RESULTS

MORNING GLORY
PA NO. 22-077

MDSL AMRB/PIONEER 4/9/93

Mine Name: Morning Glory PA# 22-077
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-077-TP1A-B		16802.2	16961.2	641.037		16179.6	7923.02		61.8608 *	698.573	62.5317 *	119.179
22-077-TP1A-C		14988.5	41048	961.103		29598.3	12030			886.019	62.1159 *	146.58
22-077-TP1B-A		30555.1	19471.1	983.941		4201.74	19012.1			669.274	835.907	64.0061
22-077-TP1B-B		25502.2	27204.6	1549.32		19782	19816.4		204.374	1165.12		175.467
22-077-TP1B-C		15825.6	43557.4	1065.62		22138.3	9900.53			400.785	36.0279 *	169.781
22-077-TP1C-A		28869.9	29914.3	1723.36		22813.7	15611.3		92.6303 *	1450.83		123.749
22-077-TP1C-B		17862.6	37374	1134.22		15937.1	12547.8			626.768		141.356
22-077-TP-1-COMP		24515.6	14870.8	806.106		7246.28	17583.6		129.146 *	923.799	1794.09	69.8616
22-077-TP-2-COMP		19040.5	28239.9	1007.83		23029.9	12108.9			937.36	119.315 *	138.836
22-077-WR1-A		25146.7	22476.7	2646.35		4212.41	23418.3		46.5928 *	341.01	52.7328 *	268.72
22-077-WR1-B		21410.5	23588.5	2251.88		5256.87	24717.8			82.0079 *	71.7039 *	401.749
22-077-WR1-C		23208	20879.8	2406.61		5111.64	25054.1			112.015 *	89.7 *	215.334
22-077-WR2-A		14377.8	17025.4	1554.01		2742.19	24714.6			78.2867 *	45.819 *	215.178
22-077-WR2-B		19270.5	16943.7	859.16		9304.34	18925.6		40.1461 *	245.909	114.065	162.447
22-077-WR3-A		18176.5	10343.4	1670.52		1797.6	23284.3			205.009	49.5867 *	335.288
22-077-WR-1-COMP		20921.2	20623.4	2203.64		4474.43	26653.9			167.809	96.0665 *	274.849
22-102-WR1-A		15047.5	4197.33	1338.88		2443.16	19691.1		88.185 *	492.37		244.594

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-077-TP1A-B	117.488		12.1998 *	203.879	141.843			228.325	134.62 *		10.5059 *
22-077-TP1A-C	120.733		13.9994 *	99.509	114.798			135.133			6.66895 *
22-077-TP1B-A	90.5229		12.3691 *	1275.13	230.584	168.255 *		268.286		27.2415 *	15.742 *
22-077-TP1B-B	83.8274		15.1009 *	1186.89	210.217			234.813	249.886 *		14.8759 *
22-077-TP1B-C	78.9624		13.5265 *	81.2494	106.844			132.739	95.8877 *	11.068 *	6.53435 *
22-077-TP1C-A	117.222		11.8957 *	464.74	201.765			289.284			13.2542 *
22-077-TP1C-B	116.326		20.1687	422.107	146.198			218.101	176.952 *		8.4196 *
22-077-TP-1-COMP	89.0262		14.9694 *	1506.78	184.069		89.0715 *	191.745		18.2409 *	20.9649 *
22-077-TP-2-COMP	114.065		13.1171 *	343.215	152.219			189.914	127.938 *		14.7269 *
22-077-WR1-A	132.948			117.452	215.965			452.759	110.552 *		15.4907 *
22-077-WR1-B	162.101		6.09221 *		177.276			450.591		11.9035 *	10.1036 *
22-077-WR1-C	178.48				206.176			446.589			14.8422 *
22-077-WR2-A	129.574			19.7325 *	169.176			362.074		13.5526 *	14.5782 *
22-077-WR2-B	123.031			58.5748 *	220.718			343.613			10.3415 *
22-077-WR3-A	163.229			88.1989	171.667			583.315			17.3704 *
22-077-WR-1-COMP	165.305		5.47412 *	69.7785	206.034			530.606			15.105 *
22-102-WR1-A	132.471			495.813	133.479			366.522			14.5084 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

MORNING GLORY
PA NO. 22-077

AIMSS SCORESHEET

SITE NAME: MORNING GLORY
PA NUMBER: 22-077

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	7.250
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		26
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	26.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	75400
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	700
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	7.823
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	19
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	104046
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		20
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	200
27		LIKELIHOOD SCORE	LINES 25 + 26C	200
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.472
29	AIR - TARGETS	POPULATION - 4 MILES		300
30		NEAREST RESIDENCE		10
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	320
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	30208
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		20
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	400
38		LIKELIHOOD SCORE	LINES 36 + 37C	450
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.448
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		10
42		RECREATIONAL USE		5
43		TARGETS SCORE	SUM LINES 40 - 42	16
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	3226
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**2.13**

SITE NAME: MORNING GLORY
PA NUMBER: 22-077

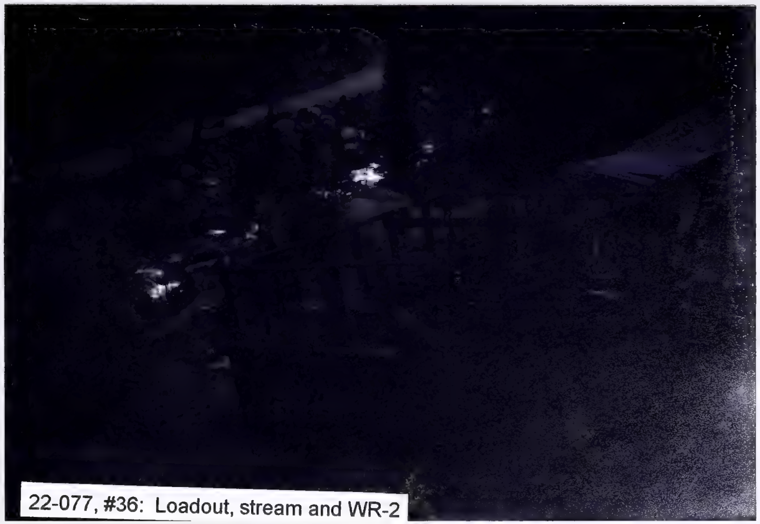
SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2	HAZARDS	OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4		UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	520
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	620
9	TARGETS	POPULATION - 1 MILE		1
10		NEAREST RESIDENCE		10
11		RECREATIONAL USE		5
12		TARGETS SCORE	SUM LINES 9 - 11	16
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**198.40**

22-077, #33: Shaft (caved)

22-077, #34: WR-1A and WR-1B area

22-077, #35: Mill, shed and WR-1C


22-077, #36: Loadout, stream and WR-2

22-077, #37: SE-1 sample location

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: NELLIE GRANT **PA#:** 22-244

Date: May 18 and 19, 1993 **Time:**

Field Team Leader: Bullock/Tuesday/Babits; Pioneer

Sampling Personnel: Flammang, Belanger, Clark,
Lasher; Pioneer
Pierson; TD&H

Visitors: Earl McCurley, MDSL
Tim Ranf, TD&H

Weather/Seasonality Observations: 5/18: 60°F; Partly cloudy.
5/19: Morning 55°F; Clear calm afternoon.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: SW-1 and SE-1 sample location; #2: TP-1 sample location; #3: Tailings pond; #4: Shaft #2; #5: WR-2-1; #6: WR-2-2; #7: Circuit breakers and generators; #8: Shaft #1 and WR-1; #11: Background soil and water location; #12,#13: South side of mill building; #14: Shaft #3; #15: WR-3; #16: Blue/green material, fine-grained in dump below Shaft #3; #17: Tails slurried down slope from mill building; #18: Runoff from tailings; #19: Wetlands receiving runoff; #20: SW-1; #21: SW-4 sample location in Lump Gulch between upgradient and ponds-old deposits; #22: Location that SW-2 drainage enters, SW-5 location in wetlands; #23: GW-4 location; #24: SW-6; #25: Downgradient Lump Gulch sample location; #26: SW-8; #27: Barrels and standing water by TP-7; #28: Evaporative salts on TP-1 berm; #29: Unvegetated area east of mill building. Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms):
Full staff on training/shakedown

Other Hazardous Materials/Substances Present:

General Comments on Potential Remedial Alternatives:
Isolate water discharges and surface water runoff from mine wastes. Cover and revegetate tailings. Reduce slopes on waste rock dumps, cover, and revegetate. There is potential to reprocess tailings and waste rock.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): NELLIE GRANT PA#: 22-244

Legal Description: T 8N ;R 5W ;Sec. 14 ,SW 1/4 SW 1/4 ___ 1/4

County: JEFFERSON Mining District: CLANCY

Latitude: N 46° 26' 16" Longitude: W 112° 12' 07"

Primary Drainage Basin and Code: Lump Gulch/10030101
Secondary Drainage Basin: Lump Gulch

USGS Quadrangle map name(s): Chessman Reservoir

Mine Type/Commodities: Hardrock/Gold, Silver, Copper, Lead, Zinc

Activity Status: Active ___ ,Inactive/Exploration X ,Abandoned ___ .

Ownership status: Known Y X N ___ ; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): Carl Byers, 3740 Canyon Ferry Road, East Helena, MT 59635; Helena National Forest.

Relationship to other mines/sites in the area/district: General Grant mine lies immediately adjacent to the west.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Reclamation alternatives are currently being evaluated by the AMRB.

General site features: Elevation 6800' , Slope 10°-25° , Aspect East

Land use: Mining ___ , Recreational X , Residential ___ , Urban ___ , Agricultural ___ , Other(Specify) ___

Area of disturbed/unvegetated lands? Approx. 50 acres.
Dimensions: ___

Predominant vegetation types: Douglas fir, Lodgepole pine, grouse whortleberry, bear grass, blue bunch wheat grass

Access: roads - good X ,poor ___ ,4wd ___ ,trail ___ .
Other logistical considerations (proximity to other sites). General Grant mine is immediately adjacent to site.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Veins in intensely sericitized Butte quartz monzonite. Mine is located just above wetlands in Frohner Meadows and on the headwaters of the perennial stream, Lump Gulch. Groundwater present in monitoring well at 2'-9' and at 24'. Water in the shaft in 1988 was approx. 30' bgs. Water in lower shaft is approx. 4' bgs.

Mining/milling history, ore type/tenor, host rock, gangue: Mine lies on a northwest trending, steeply dipping vein in sericitized Butte quartz monzonite. Minerals are galena, sphalerite, pyrite, arsenopyrite, chalcopyrite, tetrahedrite and tennanite in a fine grained aggregate. Gangue minerals are predominantly siliceous. From 1948 to 1957, production records indicate that from 1,057 tons of ore, 293 oz. Au, 10,279 oz. Ag, 3,481 lbs. Cu, 216,242 lbs. Pb, and 47,156 lbs. Zn were recovered. Mill was present at the site.

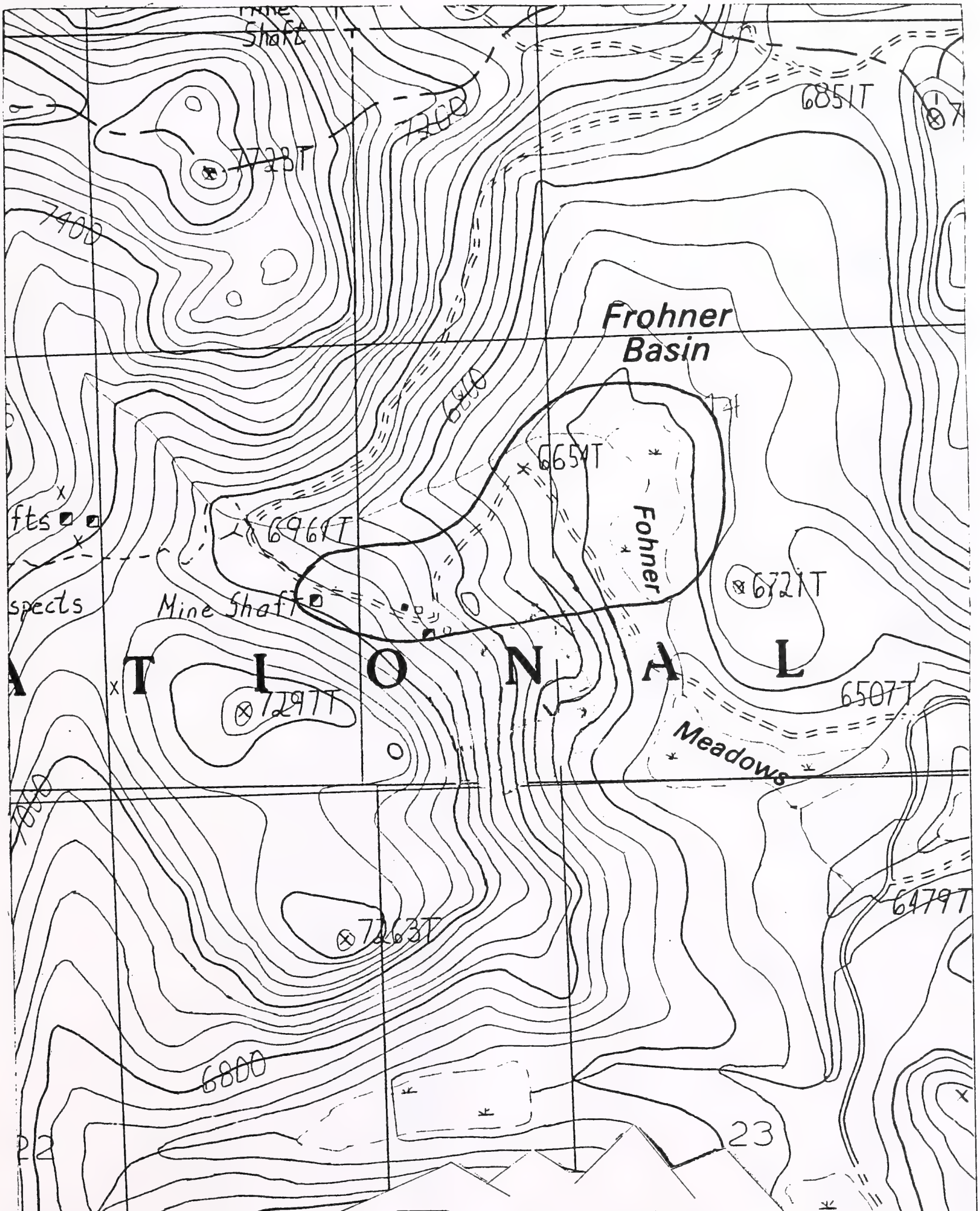
Mine Operation?
Shafts - Yes X, No ___, # 3, Comment All accessible
Adits - Yes ___, No X, # ___, Comment
Pits - Yes ___, No X, # ___, Comment
Placers - Yes ___, No X, # ___, Comment
Other - Yes ___, No X, # ___, Comment

Mill Operation? Yes X, No ___. If yes answer the next three questions:

Period(s) of Operation: Mine began in 1880's, last worked in 1882.

Origin of Ore Milled - Custom Mill ___ **Dedicated Mill** X; **Number and names of mines that supplied mill feed:** Nellie Grant and General Grant

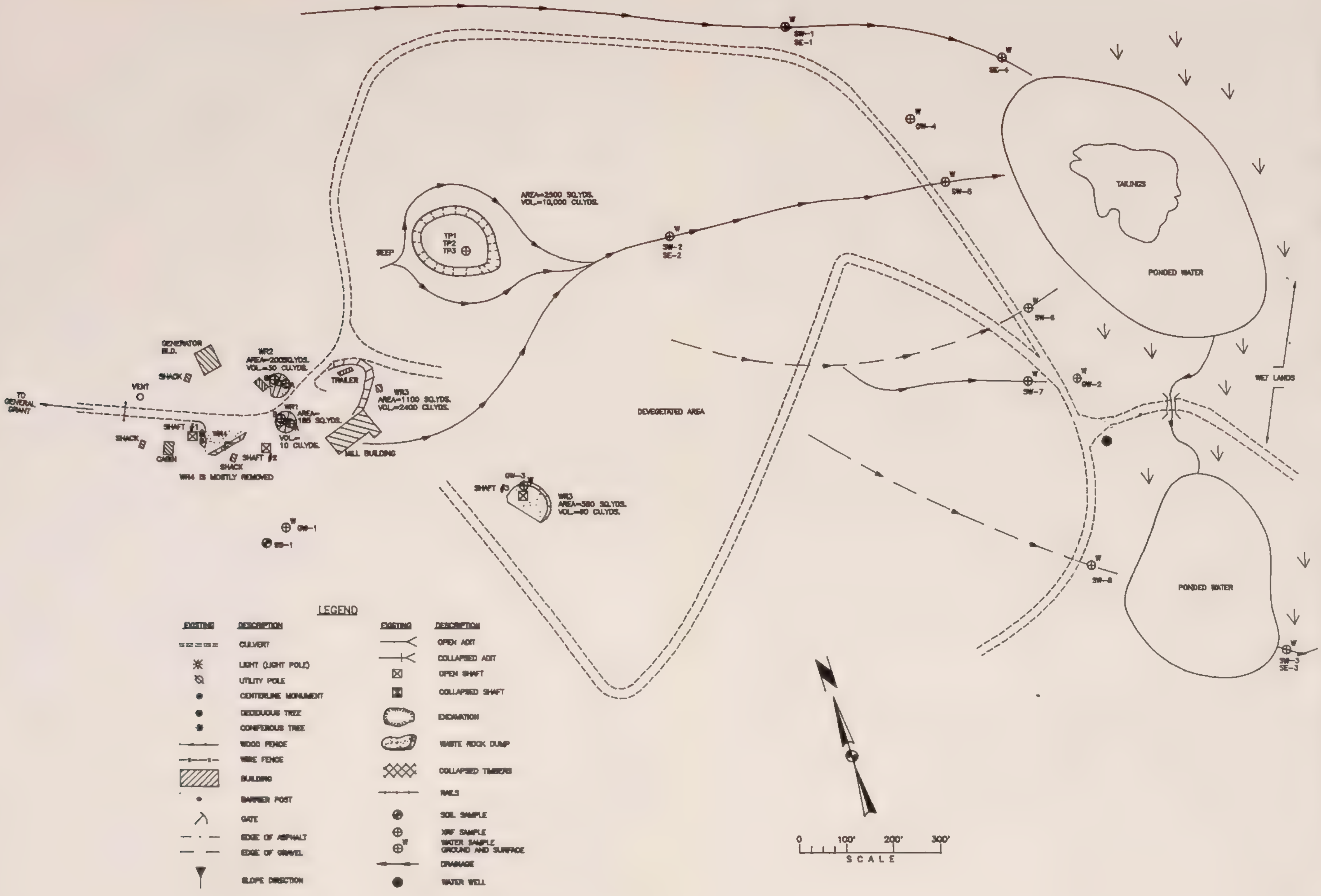
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Ball mill present; probably floatation mill



PIONEER
TECHNICAL SERVICES, INC.

NELLIE GRANT, P.A. NO. 22-244

T08N, R05W, SECTION 14
SCALE: 1" = 1000'



DRAWN JTP DATE 23 JUNE 93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

TD&H

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

NELLIE GRANT PA# 22-244
CLANCY DISTRICT JEFFERSON COUNTY

SHEET NO.

22-244.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Yellow tailings on top (approx. 5% by vol.) sand; gray underlying tailings clay

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): 2" of yellow tails on surface, then consistently gray tailings from 2" to approx. 10'.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Tailings in impoundment are saturated; tailings on hillside are partially wet.

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Tailings were slurried over the hillside below the mill for many years prior to containment in more recent years of operation.

Comments on potential for mitigation: Removal from drainages, cover with soil and revegetate; potential to reprocess.

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Babits

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1-A1	TAIL	10,000	Hole #1, top of yellow tailings	Bermed	2.3 (S)	0.05	22-244-TA-1	05/18/93 1450	T-Metals, ABA
TP-1-B1	TAIL		Hole #2, northwest corner; 6"-8', gray clay	Bermed	NM	0.05	22-244-TA-2	05/18/93 1445	T-Metals, ABA
TP-1-B2	TAIL		Hole #2, northwest corner; 8', gray clay	Bermed	NM	NM	22-244-TA-3	05/18/93 1440	T-Metals, ABA
TP-2-A1	TAIL		Top tailings below road	None	N/A	N/A	N/A	N/A	XRF Analysis
TP-2-A2	TAIL		Top tailings below road at 12"	None	N/A	N/A	N/A	N/A	XRF Analysis
WR-1-1	WR	10	Assoc. with Shaft #1	None	N/A	N/A	N/A	N/A	XRF Analysis
WR-1-2	WR		Assoc. with Shaft #1	None	N/A	N/A	N/A	N/A	XRF Analysis
WR-1-3	WR		Assoc. with Shaft #1	None	N/A	N/A	N/A	N/A	XRF Analysis
WR-2-LTRT	WR	30	Assoc. with Shaft #2	None	3.17 (S)	NM	22-244-WR-1	05/18/93 1600	T-Metals, ABA
WR-2-LTLT	WR		Assoc. with Shaft #2	None	NM	0.05			
WR-2-RTRT	WR		Assoc. with Shaft #2	None	NM	0.035			
WR-2-RTLT	WR		Assoc. with Shaft #2	None	NM	NM			
WR-3-1	WR	2,460	Assoc. with Shaft #3 by road	None	2.91 (S)	0.011	22-244-WR-3	05/18/93 1600	T-Metals, ABA
WR-3-2	WR		Assoc. with Shaft #3 by road	None	N/A	N/A	N/A	N/A	XRF Analysis
WR-3-3	WR		Assoc. with Shaft #3 by road	None	NM	NM			
WR-3-4	WR		Assoc. with Shaft #3 by road	None	NM	NM			
WR-3-5	WR		Assoc. with Shaft #3 by road	None	N/A	N/A	N/A	N/A	XRF Analysis
WR-3-6	WR		Assoc. with Shaft #3 by road	None	N/A	N/A	N/A	N/A	XRF Analysis
SS-1	BKGRND	N/A	Background soil sample adjacent to GW-1	N/A	4.10 (S)	NM	22-244-SS-1	05/19/93 1500	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-244-WR-1 is composite of WR-2-LTRT, -2-LTLT, -2-RTRT, and -2-RTLT. 22-244-WR-3 is composite of WR-3-1, -3-3, and -3-4. NM = Not Measured

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:____________

Filled shafts: Yes_X_, No___, Number:_3_ Identification: Shafts 1, 2, and 3 are not flowing; water is within 25 feet of the surface.

Seeps/Springs: Yes_X_, No____, Number:_____ Identification: Several upgradient from the site

Groundwater wells within 4 miles?: Yes_X_, No___;
Number of well logs: 62

Distance to nearest well used for drinking? Approx. 4 miles

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seep/Spring (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite_X_, Probable____, Possible____, Unlikely____.
pH of water in Shaft #3 is 3.51 and SC is 640.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Tuesday, Babits, Belanger, Pierson

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
GW-1	SP	Background spring approx. 35 yards	15 gpm (E)	6.36	40	NM	9.9	NM	N/A	22-244-GW-1	05/18/93 1715	D-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
GW-2	MW	Monitoring well furthest south along access road	2 gpm (E)	6.98	220	NM	8.6	89	1' above ground surface	22-244-GW-2	05/19/93 1030	D-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
GW-3	SH	Shaft #3 east of buildings	0	3.51	640	NM	6.9	NM	3.95 bgs	22-244-GW-3	05/18/93 1555	D-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
GW-4	MW	Monitoring well furthest north along access road	N/A	7.25	460	NM	8.0	31.4	0.92	22-244-GW-4	05/19/93 1115	D-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
Shaft #1	SH	Shaft #4 furthest east down hill	N/A	N/A	N/A	N/A	N/A	N/A	34' bgs	N/A	N/A	N/A
Shaft #2	SH	East of Shaft #1	N/A	N/A	N/A	N/A	N/A	N/A	25' bgs	N/A	N/A	N/A

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Purged approx. 12 gallons prior to sampling. Currently impossible to get water out of Shaft #1 or #2; depth to water measurement only. NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes_X__, No___, Name(s): Lump Gulch Creek and unnamed tributaries

Dry streambeds: Yes____, No_X_, Name(s):

Other surface water: Yes__X_, No___, Name(s)/Description: Snow melt runoff on and around the site

Waste materials within any floodplain: Yes_X__, No___ Source ID(s): Tailings have washed into Lump Gulch Creek.

Approximate Flood frequency?_X_1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)?
High Flow: 5.0 cfs , Average Flow: 0.5 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; Tailings have been carried down to Lump Gulch Creek.

Surface water draining onto or through waste sources: Yes_X__, No____,
Describe: Snow melt runoff and seep originating from Shaft #2 flow down through waste rock and tailings.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetlands, limited possible fishery, irrigation, stock watering

Observed erosional/sedimentation/stream turbidity problems? Yes_X_, No___, Distance downstream (ft)? 250 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Tailings washing into beaver pond below site.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALISES
SW-1	SW	Lump gulch at culvert north of main access road to logging/mine	5.96	50	NM	4.4	7.5	4 cfs (E)	22-244-SW-1	05/19/93 1325	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Lump gulch at culvert north of main access road to logging/mine	N/A	N/A	N/A	N/A	N/A	N/A	22-244-SE-1	05/19/93 1325	T-Metals
SW-2	SW	1/2 down center drainage at edge of slurried tailings and dead vegetation	3.14	1050	NM	15.5	NM	NM	22-244-SW-2	05/19/93 1440	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	1/2 down center drainage at edge of slurried tailings and dead vegetation	N/A	N/A	N/A	N/A	N/A	N/A	22-244-SE-2	05/19/93 1440	T-Metals
SW-3	SW	Outlet of pond south of access road approx. 1/4 mile southeast of site Lump Gulch	5.74	100	NM	15.5	9	5 cfs (E)	22-244-SW-3	05/19/93 1245	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-3	SE	Outlet of pond south of access road approx. 1/4 mile southeast of site Lump Gulch	N/A	N/A	N/A	N/A	N/A	N/A	22-244-SE-3	05/19/93 1245	T-Metals
SW-4	SW	Lump Gulch Creek in tailings deposit downgradient of SW-1 approx. 200 yards	5.66	55	NM	8.9	NM	4 cfs (E)	N/A	N/A	Field Parameters
SE-4	SE	Lump Gulch Creek in tailings deposit downgradient of SW-1 approx. 200 yards	N/A	N/A	N/A	N/A	N/A	N/A	22-244-SE-4	05/19/93 1345	T-Metals
SW-5	SW	Drainage SW-2 was collected in at road	3.5	NM	NM	NM	NM	0.15 cfs (E)	N/A	N/A	Field Parameters
SW-6	SW	Center line runoff following switchback road	4.78	630	NM	5.0	NM	NM	N/A	N/A	Field Parameters
SW-7	SW	Center line runoff diverting to the southeast	4.6	600	NM	7.9	NM	50 gpm (E)	N/A	N/A	Field Parameters
SE-7	SE	Center line runoff diverting to the southeast	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SW-8	SW	Southern most drainage emptying into secondary road	4.4	NM	NM	NM	NM	50 gpm (E)	N/A	N/A	Field Parameters
SE-8	SE	Southern most drainage emptying into secondary road	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 60 acres of beaver ponds/wetlands below the mine

Wetlands present: Yes X, No ___, Describe: See above

Carbonate rocks/soils: Yes ___, No X, Describe: ___

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10 ___; 10-30 ___; 30-100 X; 100-300 ___; 300-1,000 ___; 1,000-3,000 ___; 3,000-10,000 ___; 10,000 or greater ___; Comments ___

Nearest residence(ft or miles)? Approx. 3.5

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Babits

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	SO4; pH	Dry	1,665	1,665	No	Low
WR-2	SO4; pH	Partial	1,800	1,800	No	Low
WR-3	SO4; pH	Dry	15,120	15,120	No	Low
TP-1	pH; SO4	Wet	22,500	22,500	Yes	Low

Notes and Clarifications: Drainage out of WR-2 around west (upper) side of Tail-1 is AMD; pH is 2.8.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X_,
Describe:_____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments None

Evidence of recreational use on site: Yes_X_, No___, Describe: Off-road vehicle tracks, litter

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment_____
Wilderness Area - Yes___, No_X_, Comment_____
T&E Species Habitat - Yes___, No_X_, Comment_____
Bat Habitat - Yes___, No_X_, Comment_____

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_3_, types and locations:
Shafts #1, #2, and #3

Hazardous structures: Yes_X_, No___, Number_6_, types and locations:
Mill, headframe, and old shops/cabins

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:_____

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____,
Number_2_, types and locations: WR-1 and WR-2 are short, steep, and unvegetated slopes at angle of repose.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:_____

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LABORATORY ANALYTICAL DATA

NELLIE GRANT
PA NO. 22-244

Nellie Grant Mine PA# 22−244
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER−BULLOCK
INVESTIGATION DATE: 05/18/93 & 05/19/93
Page 1 of 2.

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22−244−SE−1	599	43.9	6.4	8.65	1.82 J	39.4	6860	0.122 J	1780	7.06	744	4.17 UJ	393	NR
22−244−SE−2	879	26.1	1.6	1.37 U	1.15 U	27.3	7540	0.033 J	102	2.01 U	1190	4.2 UJ	202	NR
22−244−SE−3	354	284	56.1	8.35	13.7 J	231	20700	0.274 J	763	7.16	995	10.9 UJ	2310	NR
22−244−SE−4	488	40	7.0	8.18	1.14 U	42.3	5660	0.114 J	1920	8.63	561	4.16 UJ	440	NR
22−244−TA−1	4210	46.7	10.8	1.41 U	2.36 J	50.5	29500	0.111 J	46.9	2.59	9380	4.32 UJ	763	NR
22−244−TA−2	9330	53.2	312.0	28.8	19.7 J	467	57500	0.235 J	758	36.6	13500	31 J	33700	NR
22−244−TA−3	9500	95.3	190.0	27	26 J	321	61400	0.106 J	589	37.3	9670	12.6 J	21200	NR
22−244−WR−1	969	48.5	9.2	1.31	0.93 U	87.2	6490	0.184 J	8.61	1.64 U	15500	6.74 J	934	1.07U
22−244−WR−3	2570	81.2	7.6	10.8	2.99 J	143	33600	0.156 J	73.7	1.75 U	7410	3.65 UJ	417	NR
BACKGROUND	10	52.7	1.3	3.15	2.23 J	6.12	6390	0.035 J	284	2.6	21.9	3.4 UJ	43.6	NR

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22−244−TA−1	1.49	46.5	−4.47	−51.0	1.33	0.06	0.10	1.87	−6.35
22−244−TA−2	8.95	280	5.17	−274	2.51	3.56	2.88	111	−106
22−244−TA−3	6.97	218	−2.24	−220	0.31	4.84	1.82	151	−153
22−244−WR−1	3.00	93.7	−12.7	−106	1.14	0.78	1.08	24.4	−37
22−244−WR−3	1.33	41.5	−17.9	−59.5	1.07	0.09	0.17	2.81	−20.7
22−244−WR−1DUP	3.05	95.3	−12.1	−107	1.18	0.76	1.11	23.7	−35.9

LEGEND

SE1 − Lump Gulch @ culvert N. of main access road to logging/mine.
SE2 − 1/2 way down center drainage @ edge of slurried tailings.
SE3 − Outlet of pond S. of access road in Lump Gulch.
SE4 − Lump Gulch Creek in tailings deposit downgradient of SW1.
TP1 − Sample of the subsample TP1−A1.
TP2 − Sample of the subsample TP1−B1.
TP3 − Sample of the subsample TP1−B2.
WR1 − composite of the subsamples WRD2LTRT, LTLT, RTRT, and RTLT.
WR3 − Composite of the subsamples WRD3−1, 3−3, and 3−4.
BACKGROUND − From the Nellie Grant (22−244−SS−1).
WR1DUP − Duplicate of the sample 22−244−WR−1.

Nellie Grant Mine PA# 22-244
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-BULLOCK
INVESTIGATION DATE: 05/18/93 & 05/19/93
Page 2 of 2.

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-244-GW-1	5.85	5.8	2.57	5.99 U	12.1 J	5 J	125	0.19 J	2.77	8.78 U	1.85	18.3 U	6 U	9.98
22-244-GW-2	3.85	28.3	2.55 U	5.99 U	8.37 J	1.35 U	831	0.21 J	486	8.78 U	1.36 U	18.3 U	6 U	86.7
22-244-GW-3	53.4	33.2	107	132	13.4 J	369 J	9270	0.13 J	3520	29.5	1090	18.3 U	12700	111
22-244-GW-4	4.28	22.5	82.9	5.99 U	5 U	5.2 J	13.5 U	0.091 J	1320	20	1.38	18.3 U	10600	190
22-244-SW-1	123	21.2	4.37	5.99 U	7.73 J	17.1 J	1770	0.19 J	501	8.78 U	98.5	18.3 U	315	14.1
22-244-SW-2	45.4	19.9	559	71.8	15.3 J	720 J	3830	0.21 J	9860	87	316	57.4	58900	309
22-244-SW-3	20.6	20	263	5.99 U	5 U	19.1 J	312	0.22 J	130	10.9	18.2	18.3 U	2110	27.3

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-244-GW-1	70	< 5.0	< 5	< 0.05	NR
22-244-GW-2	153	< 5.0	16	< 0.05	NR
22-244-GW-3	289	< 5.0	171	< 0.05	NR
22-244-GW-4	345	< 5.0	175	< 0.05	NR
22-244-SW-1	64	< 5.0	15	< 0.05	NR
22-244-SW-2	817	< 5.0	491	0.68	NR
22-244-SW-3	90	< 5.0 q	49	< 0.05	NR

LEGEND

GW1 - Background spring, approximately 35 yards.
GW2 - Monitoring well furthest South along access road.
GW3 - Shaft #3, East of building.
GW4 - Monitoring well furthest North along access road.
SW1 - Same as sample SE1.
SW2 - Same as sample SE2.
SW3 - Same as sample SE3.

XRF ANALYSIS RESULTS

NELLIE GRANT
PA NO. 22-244

Mine Name: Nellie Grant PA# 22-244
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-244-SE-7		36049	5060.16	2041.27		502.84 *	17860.3			521.134	502.41	449.324
22-244-SE-8		17961.6	5704.9	675.128			15622.6		158.85 *	526.27	1274.16	395.487
22-244-TP1-A1	438.427 *	16552.2	1671.04	485.994			40286.9			971.43	4107.06	220.32
22-244-TP1-B1		10094.7	1427.84	266.731 *			37879.8		183.2 *	11735.6	8113.86	69.9148
22-244-TP1-B2		18300	1681.82	291.143 *		595.367 *	44920.4		274.796 *	18637	7191.3	60.6852
22-244-TP2-A1		28332.3	5474.04	1708.86		556.566 *	18111.9			410.971	322.73	637.52
22-244-TP2-A2		19026	2096.07	362.889 *			41298.6		261.188 *	3260.12	2930.55	125.854
22-244-WR1-1	375.825 *	18370.6	938.785	327.715			14848.2			288.325	423.078	75.8272
22-244-WR1-2	401.374 *	29043.6	994.39	693.703			20553.1			145.175 *	728.927	34.5882
22-244-WR1-3		28326.6	820.114	376.467			17473.6			156.108 *	364.935	11.7023 *
22-244-WR2-LTLT		40840.4	1493.82	712.507			18511.2		141.706 *	1059.46	1996.36	203.119
22-244-WR2-LTRT		34837.5	1719.15	760.542		606.149 *	25221.9		237.707 *	1974.26	1623.04	160.622
22-244-WR2-RTLT		48142.9	1594.17	730.595			14342.6			2110.94	896.033	259.094
22-244-WR2-RTRT	583.591 *	47311.2	1507.71	725.325		434.045 *	10099.9		91.7696 *	1099.72		257.273
22-244-WR3-1		14684.2	693.57	351.745			11341			413.184		112.311
22-244-WR3-2		41763.4	783.441 *	652.715			14564.3			122.898 *	329.913	85.6975
22-244-WR3-3		20526.1	4242.96	1426.72			29146.9			292.222	1129.25	407.299
22-244-WR3-4		14989.8	788.106	409.547			70998.2		267.108 *	298.503	6677.28	86.8969
22-244-WR3-5		27716.4	2145.37	572.565			14659.9			610.991	51.2104 *	378.972
22-244-WR3-6		7795.64	273.901 *	172.205 *			4434.43			85.7896 *		47.8115
22-244-WR-3-COMP		20297.7	3018.97	863.433			28466.6		127.751 *	335.159	1971.71	211.866

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-244-SE-7	195.184			1010.39	149.657	260.073 *		1018.85			
22-244-SE-8	78.8744			983.573	83.5405		189.124 *	1133.77			
22-244-TP1-A1	72.3659			7380.04	150.624	187.081 *		479.482			
22-244-TP1-B1	44.5047			4651.07	73.0379 *	250.432 *		117.872			
22-244-TP1-B2	44.9263			6370.5	117.755	362.098 *		180.828	110.864 *	21.0762 *	
22-244-TP2-A1	137.991			540.212	132.683			1126.69			
22-244-TP2-A2	48.3512			3669.42	141.941	157.316 *		358.157	155.296 *		
22-244-WR1-1	81.3468	65.4572 *		1192.45	169.642		115.607 *	571.687			
22-244-WR1-2	89.8776	71.104 *		2439.41	266.234		148.004 *	255.265			
22-244-WR1-3	85.9436	61.5663 *		651.818	222.619		146.859 *	228.348			
22-244-WR2-LTLT	99.5219			11043.4	280.765	131.457 *		249.239	86.6481 *		
22-244-WR2-LTRT	86.5246			19163.7	212.737		65.4224 *	199.954	84.1272 *		
22-244-WR2-RTLT	91.7803			6286.44	314.28	145.419 *		185.364	70.6172 *		
22-244-WR2-RTRT	98.0473			10678.6	316.376	129.582 *		190.247			
22-244-WR3-1	52.7232		6.08996 *	5227.73	134.972		39.4781 *	389.592			
22-244-WR3-2	104.571			320.068	242.223	111.442 *	49.0359 *	771.465			
22-244-WR3-3	112.936			1197.28	141.425			862.546			
22-244-WR3-4	48.3467	77.0525 *	24.0597 *	10037.5	115.11	216.365 *	224.823	408.764			
22-244-WR3-5	119.896			133.279	159.037			1249.7			
22-244-WR3-6	31.7536		6.06078 *	3708.24	86.3385		103.756 *	287.655			26.2139 *
22-244-WR-3-COMP	93.074		10.531 *	6770.02	142.078			448.347			

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

NELLIE GRANT
PA NO. 22-244

AIMSS SCORESHEET

SITE NAME: NELLIE GRANT
PA NUMBER: 22-244

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
2		EXCEEDENCES		100
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	800
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	179.070
6	GW - TARGETS	WELLS - 1 MI. x 2.5		22.5
7		WELLS - 1 TO 4 MI		53
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	75.5
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	10815828
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	190.436
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		1
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	18
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	2742278
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.706
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	40
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	5412
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	2.517
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		2
43		TARGETS SCORE	SUM LINES 40 - 42	2
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	755
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**135.64**

SITE NAME: NELLIE GRANT
PA NUMBER: 22-244

LINE NO.		**SITE SAFETY**		
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	300
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	240
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	540
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		2
12		TARGETS SCORE	SUM LINES 9 - 11	2
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**21.60**

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.

P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
800-873-5227

LABORATORY REPORT

TO: Delta Engineering
ADDRESS: P.O. Box 1481
Great Falls, MT 59403
Attn: Craig Novak

LAB NO.: 89-12632
DATE: 08/18/89 dya

WATER ANALYSIS

Nellie Grant Monitoring Well
Sampled 07/28/89 @ 1930
Submitted 08/07/89

Constituent	mg/l	
Sodium	11	
Calcium	71	
Magnesium	9	
Sulfate	167	
Total Hardness as CaCO3	214	
Total Alkalinity as CaCO3	50	
Specific Conductance @ 25°C	461	µmhos/cm
pH, s.u.	6.4	
Arsenic	<0.005	
Cadmium	0.016	
Copper	<0.01	
Iron	0.33	
Lead	0.01	
Maganese	1.01	
Mercury	<0.001	
Zinc	1.39	

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.

P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
800-873-5227

LABORATORY REPORT

TO: Delta Engineering
ADDRESS: P.O. Box 1481
Great Falls, MT 59403

LAB NO.: 89-19705
DATE: 11/15/89 dya

WATER ANALYSIS

Nellie Grant Mine, Groundwater
Sampled 10/30/89 @ 1230
Submitted 11/01/89

Constituent	mg/l
Sodium	14
Calcium	106
Magnesium	11
Sulfate	293
Total Hardness as CaCO3	312
Total Alkalinity as CaCO3	37
Specific Conductance @ 25°C	642 µmhos/cm
pH, s.u.	6.5
Metals:	
Arsenic	0.009
Cadmium	0.106
Copper	<0.01
Iron	0.06
Lead	<0.01
Manganese	2.80
Mercury	<0.001
Zinc	10.2

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
P.O. BOX 30916 • 1107 SOUTH BROADWAY • BILLINGS, MT 59107-0916 • PHONE (406) 252-6325
FAX (406) 252-6069 • 1-800-873-5227

LABORATORY REPORT

TO: Peccia & Associates
ADDRESS: 810 Hialeah Court
P.O. Box 5653
Helena, MT 59601
Attn: Bob Morton

LAB NO.: 90-19455-56
DATE: 07/24/90 mme

RECEIVED
JUL 25 1990
ROBERT PECCIA
& ASSOCIATES

SOIL ANALYSIS

NELLIE GRANT
Sampled 07/16/90
Submitted 07/18/90

page 1

Sample Number	19455	19456
Location	Settling Pond	Drain Field Area
pH	5.1	4.5
Cond., mmhos/cm	8.39	1.05
Nitrate as N, ug/g	<1	<1
Phosphorus, ug/g	1.5	18.3
Potassium, ug/g	60	20
Total Cyanide, ug/g	0.7	0.6
Lime as $CaCO_3$ %	<0.1	<0.1
Neut. Pot., (2)	<1	<1
Acid Pot., meq/100g	474	11
Acid-Base Pot., (2)	-237	-6
Hot H_2O Extractable Sulfur, %	0.29	0.08
HCl Extractable Sulfur, %	0.71	0.03
HNO_3 Extractable Sulfur, %	5.20	0.15
Residual Sulfur, %	1.68	<0.01
(2) T $CaCO_3$/~~1000 Tons~~ HECTARE	20.1	13.7

LABORATORY REPORT

TO: Peccia & Associates
ADDRESS: Bob Morton
P.O. Box 5653
Helena, MT 59601

LAB NO.: 90-19455-56
DATE: 07/24/90 mme

RECEIVED
JUL 25 1990
ROBERT PECCIA
& ASSOCIATES

SOIL ANALYSIS

Sampled 07/16/90
Submitted 07/18/90

Sample Number	19455	19456
Location	Settling Pond	Drain Field Area
Total Metals (1)		
Iron, ug/g	63100	13500
Manganese, ug/g	875	314
Zinc, ug/g	32900	741
Aluminum, ug/g	3580	5680
Arsenic, ug/g	8870	1150
Cadmium, ug/g	420	24
Chromium, ug/g	17	5
Lead, ug/g	10700	1850
Mercury, ug/g	<5	<5
Silver, ug/g	28	5
5% Acetic Acid Extractable Metals		
Aluminum, ug/g	76	47
Arsenic, ug/g	184	14
Cadmium, ug/g	27	1
Chromium, ug/g	<1	<1
Lead, ug/g	24	57
Mercury, ug/g	<1	<1
Silver, ug/g	<1	<1

(1) EPA Method 3050

Nellie Grant Mine
Water Analysis
(From Sparrow's Office File)

Parameter (mg/l)	#1 Sparrow Above Effluent 9-18-80	#2 Sparrow Effluent 9-18-80	#3 Sparrow 9-18-80	Mine Discharge 9-26-80	Settled Mine Discharge 9-26-80
Aluminum	0.9	0.3	0.1	7.8	<0.1
Arsenic				20	0.045
Boron	<0.1	<0.1	<0.1		
Cadmium	0.012	0.025	<0.001	1.4	0.37
Chromium	<0.02	<0.02	<0.02	0.03	<0.02
Copper	0.04	0.02	0.01	1.67	0.02
Iron	0.84	0.94	0.46	116	1.55
Lead	0.26	0.16	<0.01	48.6	0.42
Magnesium	2.1	5.1	2.6		
Manganese	1.68	3.57	0.47	7.34	2.76
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	0.1	<0.1	<0.1	0.15	<0.1
Zinc	2.18	5.36	0.21	65	16
Phosphorus				0.04	
Nitrate				1.3	
Ph				5.4	

Nellie Grant Mine
Water Analysis

Parameter (mg/l)	Mill Building 7-16-90	Ditch Near Settling Pond 7-16-90	Near Drainfield 7-16-90	Below Deveg Area 11-13-90	Above Tailings 6-11-79	Below Tailings 6-11-79	Above Mine Discharge 7-23-79	Below Mine Discharge 7-23-79	Groundwater 10-30-89	Monitoring Well 7-28-89
pH (s.u.) :	6.3	3.3	3.17	4.1	6.86	6.62	7.59	6.83	6.5	6.4
Spec Cond @ 25 C, umhos/cm:	175	729	300	1389	63.9	62.3	150.4	129.9	642	461
Total Cyanide :	<.005	<.005	<.005	<.005	<0.001	<0.001	0.001	0.007		
Acidity :	13	102		280						
Sulfate :	69	166		838					293	167
Sodium :									14	11
Calcium :									106	71
Magnesium :									11	9
Total Alkalinity as CaCO3 :									37	50
Total Hardness as CaCO3 :									312	214
Dissolved Oxygen :	1.7		2							
Total Diss. Solids :	96		315	370						
METALS:										
Aluminum :	<0.1	1.4	4.5	11.1						
Arsenic :	0.08	0.34	0.13	0.013	0.034	0.033	0.085	0.061	0.009	<.005
Cadmium :	0.05	0.202	0.205	0.769					0.106	0.016
Copper :	0.05	0.36	0.14	0.53	0.01	0.01	<0.01	0.01	<0.01	<0.01
Iron :	0.8	8.84	10.1	0.53	0.58	0.5	2	1.1	0.06	0.33
Lead :	0.07	0.94	0.92	0.26	<0.05	<0.05	0.008	0.013	<0.01	0.01
Manganese :	1.07	2.87	6.9	21	0.11	0.1			2.8	1.01
Zinc :	6.23	21.9	23.8	95.9	0.3	0.27	0.18	0.24	10.2	1.39

Nellie Grant Mine
Soil Analysis

Parameter	Tailings Pond 7-16-90	Tailings Pond 11-30-90	Drain Field Area 7-16-90	East Spoils 11-30-90	Mill Building 11-30-90
pH (s.u.)	5.1	3.9	4.5	3.5	2.3
Cond. (mmhos/cm)	8.39	7.69	1.05	1.81	8.95
Lime Requirement (1)	20.1	8	13.4	9	12.7
Total Sulfur, %		5.8		<1	3.06
Hot H_2O Ext Sulfur %	0.29	0.65	0.08	<0.01	0.33
HCL Ext Sulfur, %	0.71	0.45	0.71	<0.01	0.95
HNO_3 Ext Sulfur, %	5.2	3.81	0.15	<0.01	1.5
Residual Sulfur, %	1.68	0.089	<0.01	<0.01	0.28
Total Cyanide, ug/g	0.7	<0.1	0.6	<0.1	<0.1
Nitrate as N, ug/g	<1		<1		
Phosphorus, ug/g	1.5		18.3		
Potassium, ug/g	60		20		
Lime as $CaCO_3$, %	<0.1		<0.1	<0.1	0.1
Neut. Pot. (2)	<1		<1		
Acid Pot., meq/100g	474		11		
Acid-Base Pot. (2)	-237		-6		
TOTAL METALS, ug/g:					
Aluminum	3580	2095	47	7470	2710
Arsenic	8870	1510	14	55	2320
Cadmium	420	69	1	<20	80
Chromium	17		<1		
Gold		<20		<20	<20
Iron	63100	24300	13500	5790	23600
Lead	10700	3170	1850	570	11100
Manganese	875	29	314	1340	<20
Mercury	<5		<5		
Silver	28	<20	5	<20	28
Zinc	32900	4480	741	280	4740
5% ACETIC ACID EXTRACTABLE METALS ug/g:					
Aluminum	76				
Arsenic	184				
Cadmium	27				
Chromium	<1				
Lead	24				
Mercury	<1				
Silver	<1				

(1) Metric Tons/Hectare   (2) T $CaCO_3$/1000 Tons

Nellie Grant Mine
Toxicity Characteristics Leaching Procedure
Waste Analysis

East Spoils
11-30-90

Metals	CAS No.	Regulatory Limit, mg/l	Minimum Reporting Limit, mg/l	Uncorrected for Spike Recovery Result, mg/l in Extract	Corrected for Spike Recovery Result, mg/l in Extract
Arsenic	7440-38-2	5.0	0.5	<0.5	<0.5
Cadmium	7440-43-9	1.0	0.1	<0.1	<0.1
Lead	7439-92-1	5.0	0.5	<0.5	<0.5
Mercury	7439-97-6	0.2	0.02	<0.02	<0.02
Silver	7440-22-4	5.0	0.5	<0.5	<0.5
Zinc			0.5	5.0	5.2

Mill Building
11-30-90

Metals	CAS No.	Regulatory Limit, mg/l	Minimum Reporting Limit, mg/l	Uncorrected for Spike Recovery Result, mg/l in Extract	Corrected for Spike Recovery Result, mg/l in Extract
Arsenic	7440-38-2	5.0	0.5	7.0	7.1
Cadmium	7440-43-9	1.0	0.1	0.5	0.5
Lead	7439-92-1	5.0	0.5	6.0	6.2
Mercury	7439-97-6	0.2	0.02	<0.02	<0.02
Silver	7440-22-4	5.0	0.5	<0.5	<0.5
Zinc			0.5	43	45

Tailings Pond
11-30-90

Metals	CAS No.	Regulatory Limit, mg/l	Minimum Reporting Limit, mg/l	Uncorrected for Spike Recovery Result, mg/l in Extract	Corrected for Spike Recovery Result, mg/l in Extract
Arsenic	7440-38-2	5.0	0.5	10.2	10.3
Cadmium	7440-43-9	1.0	0.1	1.9	1.95
Lead	7439-92-1	5.0	0.5	43	44
Mercury	7439-97-6	0.2	0.02	<0.02	<0.02
Silver	7440-22-4	5.0	0.5	<0.5	<0.5
Zinc			0.5	140	150

East Spoils
11-30-90

Metals	Spike Concentration, mg/l	Spike Percent Recovery
Arsenic	0.25	100
Cadmium	0.25	95
Lead	0.25	97
Mercury	0.001	119
Silver	0.25	87
Zinc	0.25	96

```
STATE HEALTH DEPT.          WATER QUALITY BUREAU            HELENA, MONTANA  59601

           STATE  MONTANA                                     COUNTY  JEFFERSON
       LAT.-LONG.                                    SAMPLE LOCATION   8N  5W 14CBD
    STATION CODE                                     ANALYSIS NUMBER   77W1316
    DATE SAMPLED  07-05-77                            DRAINAGE BASIN   041I -U MISSCURI
    TIME SAMPLED  1630                               WATER FLOW RATE
  METHOD SAMPLED  GRAB                        FLOW MEASUREMENT METHOD
   SAMPLE SOURCE  SPRING                     ALTITUDE OF LAND SURFACE
       WATER USE  DOMESTIC                  TOTAL WELL DEPTH BELOW LS
      AQUIFER(S)                             SWL ABOVE(+) OR BELOW LS
      SAMPLED BY  WQBH                      SAMPLE DEPTH BELOW SURFACE

          SAMPLING SITE: SPRING WATER NEAR NELLIE GRANT MINE

                       MG/L      MEQ/L                                MG/L      MEQ/L
   CALCIUM (CA)                            BICARBONATE(HCO3)
 MAGNESIUM (MG)                              CARBONATE (CO3)
    SODIUM (NA)                               CHLORIDE  (CL)
 POTASSIUM  (K)                               SULFATE (SO4)    48.0      0.999
      IRON (FE)                              FLUORIDE    (F)
 MANGANESE (MN)                          PHOSPHATE(PO4 AS P)
  ALUMINUM (AL)                           NO3+NO2(TOT AS N)

                      ------     ------                              ------     ------
   SUM CATIONS          0.0        0.0                 SUM ANIONS    48.000     0.999

                LABORATORY PH       6.10     TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)                TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)                LABORATORY TURBIDITY (JTU)
 LAB CONDUCTIVITY-UMHOS-25C  179.2            SODIUM ADSORPTION RATIO

                   ADDITIONAL  PARAMETERS
    COPPER,TR (MG/L AS CU)      .20            IRON,TR (MG/L AS FE)        1.1
      ZINC,TR (MG/L AS ZN)     3.9       MANGANESE,TR(MG/L AS MN)          .12
      LEAD,TR (MG/L AS PB)      .10      CADMIUM, TR (MG/L AS CD)         .030
   SILVER, TR (MG/L AS AG)   < 0.05       ARSENIC,TR (MG/L AS AS)          .30
  MERCURY, TR (MG/L AS HG)      .0003

REMARKS: BOULDER BATHOLITH 0662    USED FOR DRINKING

EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

SAMPLE NO 04         SAMPLER   DP    HANDLING 2100    ANALYST   ME    LAB  WQBH
COMPLETED 09-16-77  COMPUTER RUN 09/27/77  DATA 0975/PROG 0876 FUND 0662
STND DEV. ION BALANCE  9.99    CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
SEGMENT        MPDES           0.0   0.0   0.0   0.0  0.0100.0  0.0   0.0  0.0
CALC. MEQ/L= INSUFFICIENT DATA                                          77W1316
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STATE HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

          STATE  MONTANA                                 COUNTY  JEFFERSON
    LAT.-LONG.                                 SAMPLE LOCATION   8N  5W 14C8D
  STATION CODE                                 ANALYSIS NUMBER  77W1315
  DATE SAMPLED  07-05-77                        DRAINAGE BASIN  041I -U MISSOURI
  TIME SAMPLED  1600                           WATER FLOW RATE
METHOD SAMPLED  GRAB                     FLOW MEASUREMENT METHOD
 SAMPLE SOURCE  MINE DRAIN             ALTITUDE OF LAND SURFACE
     WATER USE  UNUSED               TOTAL WELL DEPTH BELOW LS
    AQUIFER(S)                         SWL ABOVE(+) OR BELOW LS
    SAMPLED BY  WQBH                 SAMPLE DEPTH BELOW SURFACE

         SAMPLING SITE: WATER IN NELLIE GRANT MINE

                     MG/L      MEQ/L                              MG/L       MEQ/L
  CALCIUM (CA)                             BICARBONATE(HCO3)
MAGNESIUM (MG)                               CARBONATE (CO3)
   SODIUM (NA)                                CHLORIDE   (CL)
POTASSIUM  (K)                                 SULFATE (SO4)     36.0        0.750
     IRON (FE)                                FLUORIDE    (F)
MANGANESE (MN)                           PHOSPHATE(PO4 AS P)
 ALUMINUM (AL)                             NO3+NO2(TOT AS N)

                    -----      -----                           ------      ------
   SUM CATIONS        0.0        0.0               SUM ANIONS  36.000       0.750

               LABORATORY PH       6.30     TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)                TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)                LABORATORY TURBIDITY (JTU)
 LAB CONDUCTIVITY-UMHOS-25C    166.9          SODIUM ADSORPTION RATIO

                A D D I T I O N A L     P A R A M E T E R S
   COPPER,TR (MG/L AS CU)        .08          IRON,TR (MG/L AS FE)        6.9
     ZINC,TR (MG/L AS ZN)      15.        MANGANESE,TR(MG/L AS MN)        .56
     LEAD,TR (MG/L AS PB)     < 0.05      CADMIUM, TR (MG/L AS CD)        .046
  SILVER, TR (MG/L AS AG)     < 0.05       ARSENIC,TR (MG/L AS AS)        .001
 MERCURY, TR (MG/L AS HG)     < 0.0002

REMARKS: BOULDER BATHOLITH 0662

EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO 03        SAMPLER    DP     HANDLING 2100    ANALYST   ME    LAB  WQBH
COMPLETED 09-16-77  COMPUTER RUN 09/27/77  DATA 0975/PROG 0876 FUND 0662
STND DEV. ION BALANCE  7.82     CA    MG    NA     K    CL   SO4   HCO3  CO3   NO3
SEGMENT        MPDES            0.0   0.0   0.0   0.0   0.0100.0   0.0   0.0   0.0
CALC. MEQ/L= INSUFFICIENT DATA                                              77W1315
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STATE HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

        STATE  MONTANA                                  COUNTY  JEFFERSON
     LAT.-LONG.                               SAMPLE LOCATION   8N   5W 14CBD
   STATION CODE                               ANALYSIS NUMBER  77W1316
   DATE SAMPLED  07-05-77                      DRAINAGE BASIN  041I -U MISSOURI
   TIME SAMPLED  1630                         WATER FLOW RATE
METHOD SAMPLED  GRAB                     FLOW MEASUREMENT METHOD
 SAMPLE SOURCE  SPRING                  ALTITUDE OF LAND SURFACE
     WATER USE  DOMESTIC               TOTAL WELL DEPTH BELOW LS
    AQUIFER(S)                          SWL ABOVE(+) OR BELOW LS
    SAMPLED BY  WQBH                  SAMPLE DEPTH BELOW SURFACE

         SAMPLING SITE: SPRING WATER NEAR NELLIE GRANT MINE

                   MG/L      MEQ/L                              MG/L      MEQ/L
  CALCIUM (CA)                             BICARBONATE(HCO3)
MAGNESIUM (MG)                               CARBONATE (CO3)
   SODIUM (NA)                                CHLORIDE   (CL)
POTASSIUM  (K)                                 SULFATE (SO4)    48.0        0.999
     IRON (FE)                                FLUORIDE    (F)
MANGANESE (MN)                         PHOSPHATE(PO4 AS P)
 ALUMINUM (AL)                           NO3+NO2(TOT AS N)

                  ------     ------                          ------      ------
   SUM CATIONS      0.0        0.0                SUM ANIONS  48.000      0.999

               LABORATORY PH       6.10     TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)                TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)                LABORATORY TURBIDITY (JTU)
 LAB CONDUCTIVITY-UMHOS-25C   179.2          SODIUM ADSORPTION RATIO

                  A D D I T I O N A L   P A R A M E T E R S
    COPPER,TR (MG/L AS CU)        .20        IRON,TR (MG/L AS FE)       1.1
      ZINC,TR (MG/L AS ZN)       3.9      MANGANESE,TR(MG/L AS MN)       .12
      LEAD,TR (MG/L AS PB)        .10     CADMIUM, TR (MG/L AS CD)       .030
   SILVER, TR (MG/L AS AG)    < 0.05       ARSENIC,TR (MG/L AS AS)       .30
 MERCURY, TR (MG/L AS HG)        .0003

REMARKS: BOULDER BATHOLITH 0662    USED FOR DRINKING

EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO 04        SAMPLER   DP    HANDLING 2100    ANALYST   ME   LAB  WQB
COMPLETED 09-16-77  COMPUTER RUN 09/27/77  DATA 0975/PROG 0876 FUND 0662
STND DEV. ION BALANCE  9.99      CA    MG    NA    K    CL  SO4  HCO3  CO3  NO3
SEGMENT      MPDES              0.0   0.0   0.0  0.0  0.0100.0  0.0  0.0  0.0
CALC. MEQ/L= INSUFFICIENT DATA                                          77W1316
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STATE HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

         STATE  MONTANA                                  COUNTY  JEFFERSON
    LAT.-LONG.                                  SAMPLE LOCATION   8N  5W 14CBD
  STATION CODE                                  ANALYSIS NUMBER  77W1315
  DATE SAMPLED  07-05-77                         DRAINAGE BASIN  0411 -U MISSOURI
  TIME SAMPLED  1600                            WATER FLOW RATE
METHOD SAMPLED  GRAB                    FLOW MEASUREMENT METHOD
 SAMPLE SOURCE  MINE DRAIN             ALTITUDE OF LAND SURFACE
     WATER USE  UNUSED               TOTAL WELL DEPTH BELOW LS
    AQUIFER(S)                          SWL ABOVE(+) OR BELOW LS
    SAMPLED BY  WQBH                  SAMPLE DEPTH BELOW SURFACE

        SAMPLING SITE: WATER IN NELLIE GRANT MINE

                     MG/L      MEQ/L                                MG/L      MEQ/L
  CALCIUM (CA)                              BICARBONATE(HCO3)
MAGNESIUM (MG)                                CARBONATE (CO3)
   SODIUM (NA)                                 CHLORIDE  (CL)
POTASSIUM  (K)                                  SULFATE (SO4)   36.0       0.750
     IRON (FE)                                 FLUORIDE   (F)
MANGANESE (MN)                            PHOSPHATE(PO4 AS P)
 ALUMINUM (AL)                              NO3+NO2(TOT AS N)

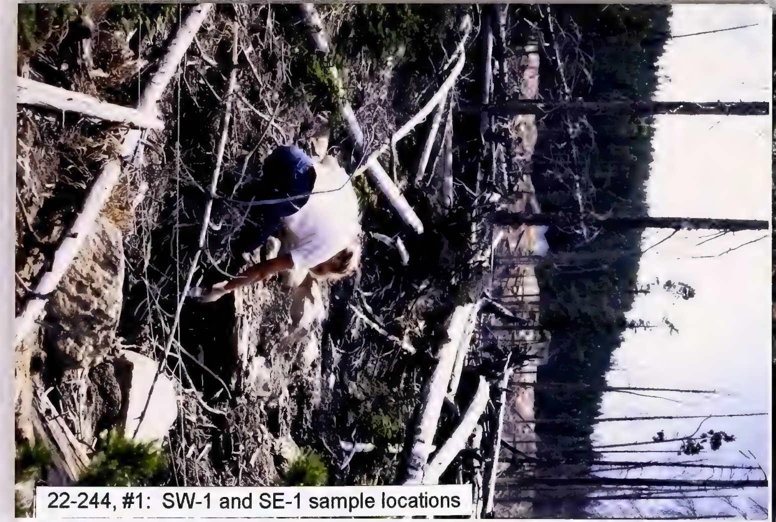
                    ------     ------                            ------     ------
    SUM CATIONS      0.0        0.0                SUM ANIONS    36.000      0.750

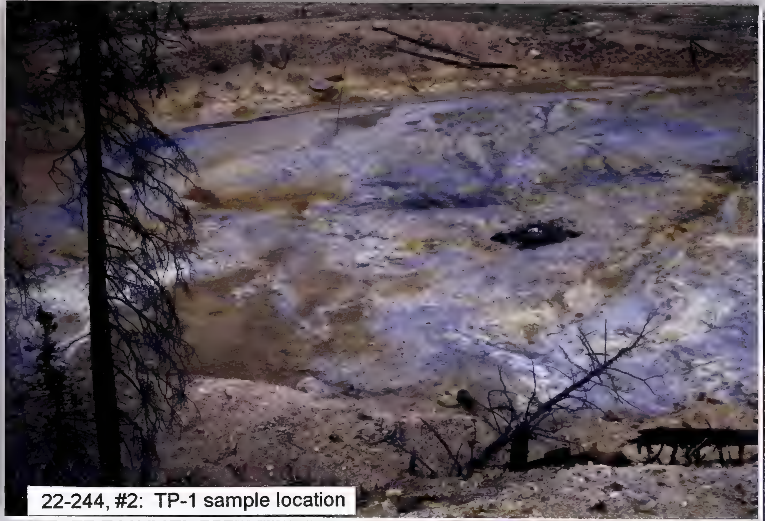
               LABORATORY PH      6.30     TOT HARDNESS(MG/L-CACO3)
FIELD WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (JTU)
 LAB CONDUCTIVITY-UMHOS-25C   166.9          SODIUM ADSORPTION RATIO

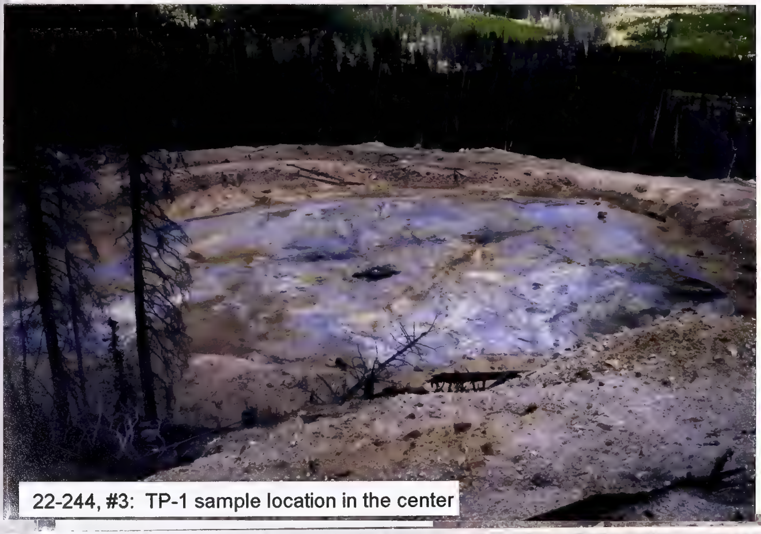
                 A D D I T I O N A L   P A R A M E T E R S
   COPPER,TR (MG/L AS CU)       .08           IRON,TR (MG/L AS FE)       6.9
     ZINC,TR (MG/L AS ZN)     15.        MANGANESE,TR(MG/L AS MN)         .56
     LEAD,TR (MG/L AS PB)    < 0.05      CADMIUM, TR (MG/L AS CD)         .046
   SILVER, TR (MG/L AS AG)   < 0.05        ARSENIC,TR (MG/L AS AS)        .001
  MERCURY, TR (MG/L AS HG)   < 0.0002

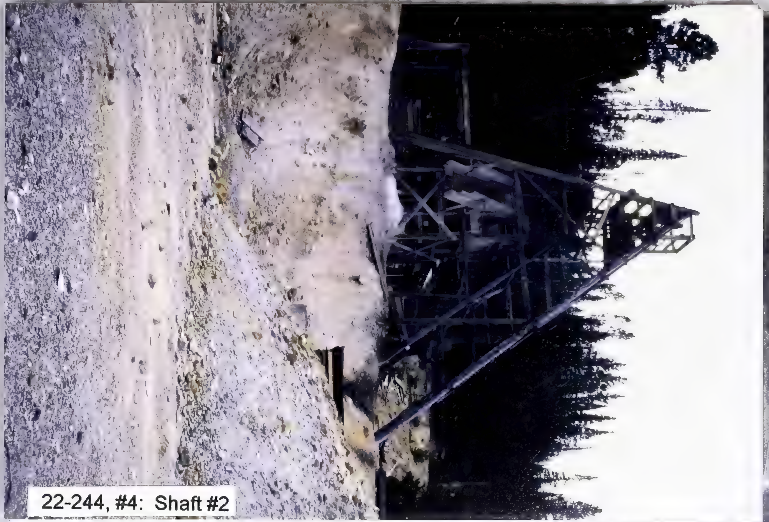
REMARKS: BOULDER BATHOLITH 0662

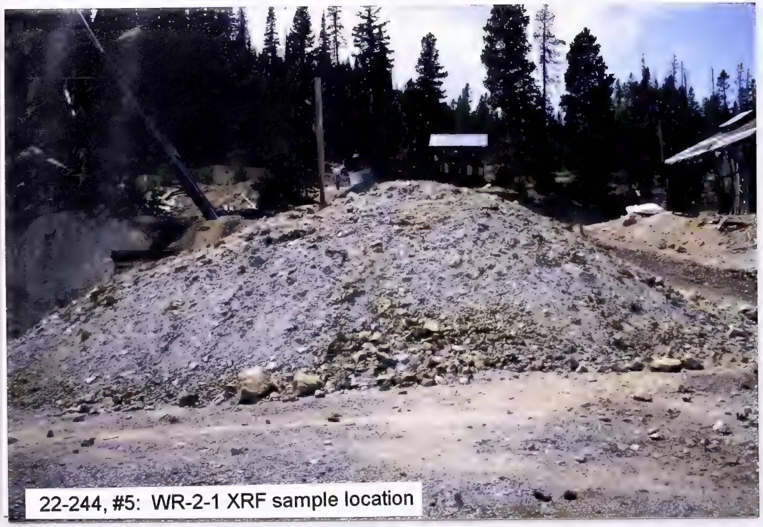
EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO 03        SAMPLER   DP     HANDLING 2100     ANALYST   ME    LAB  WQBH
COMPLETED 09-16-77  COMPUTER RUN 09/27/77  DATA 0975/PROG 0876 FUND 0662
STND DEV. ION BALANCE  7.82     CA    MG    NA    K    CL  SO4   HCO3   CO3   NO3
SEGMENT       MPDES             0.0   0.0   0.0   0.0  0.0100.0  0.0   0.0   0.0
CALC. MEQ/L= INSUFFICIENT DATA                                            77W1315
```


22-244, #1: SW-1 and SE-1 sample locations

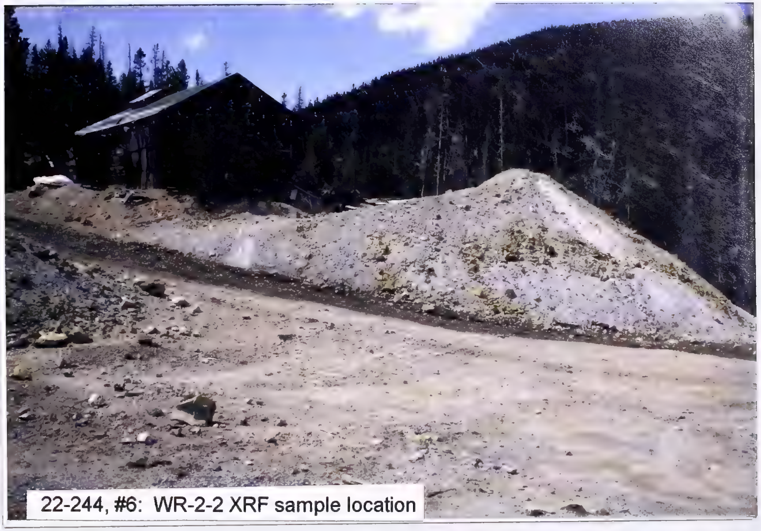

22-244, #2: TP-1 sample location


22-244, #3: TP-1 sample location in the center

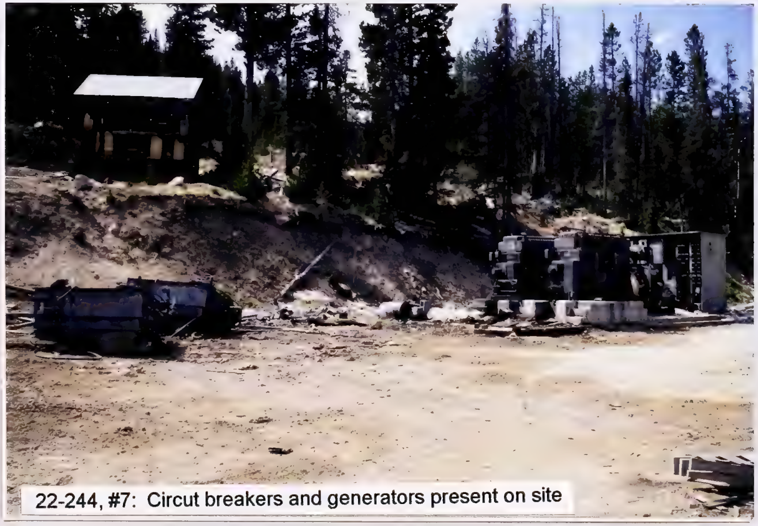

22-244, #4: Shaft #2



22-244, #5: WR-2-1 XRF sample location



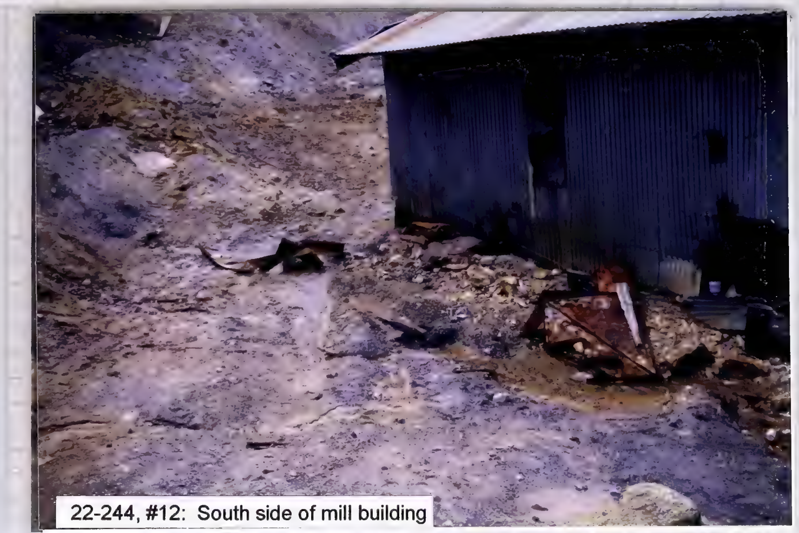
22-244, #6: WR-2-2 XRF sample location

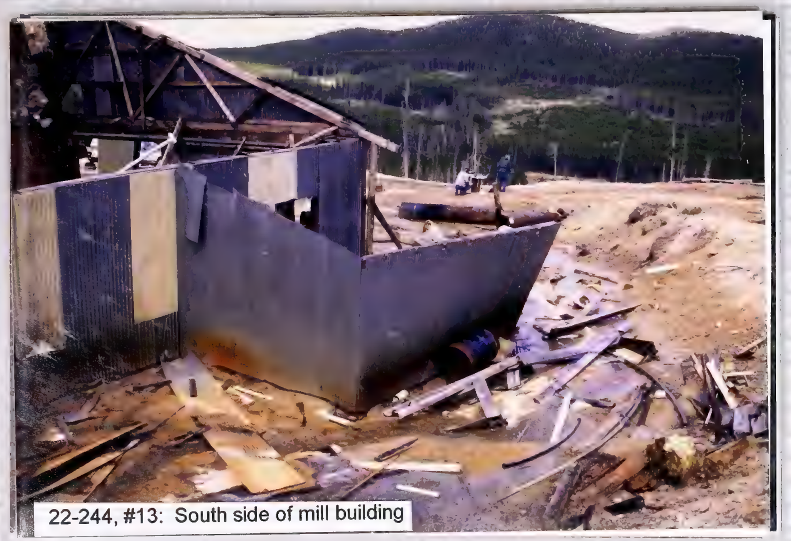


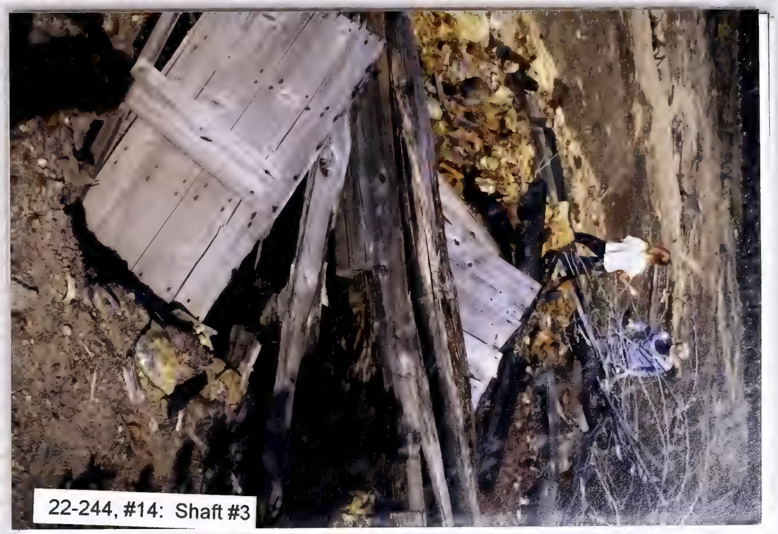
22-244, #7: Circut breakers and generators present on site

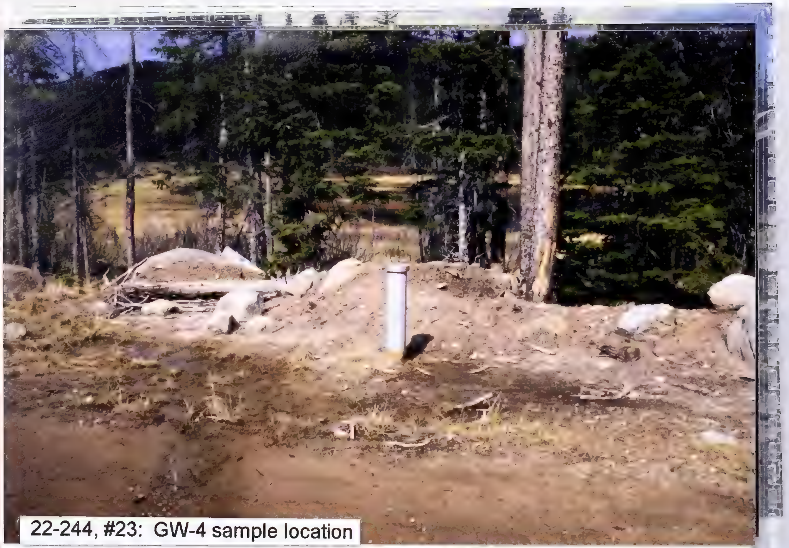
22-244, #8: Shaft #1 and WR-1

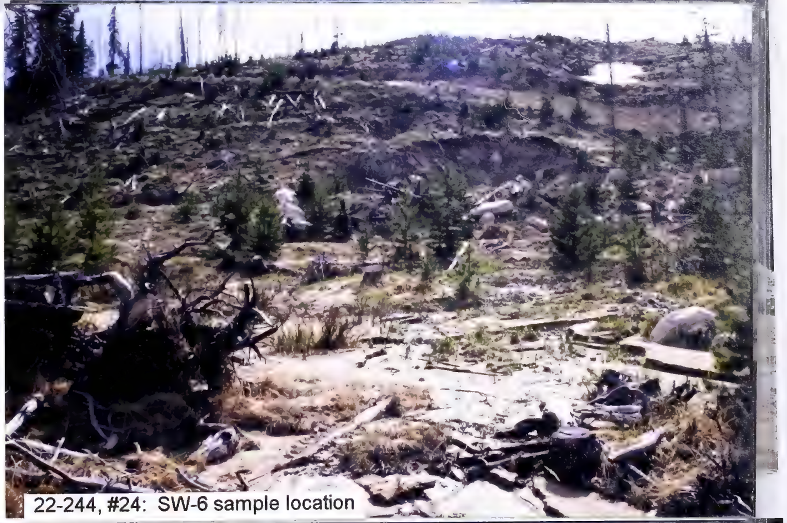
22-244, #11: Background soil and water location

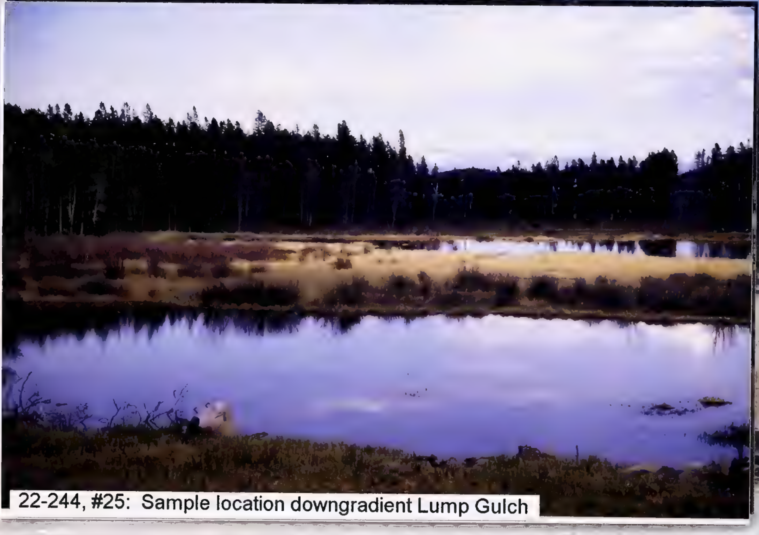

22-244, #12: South side of mill building

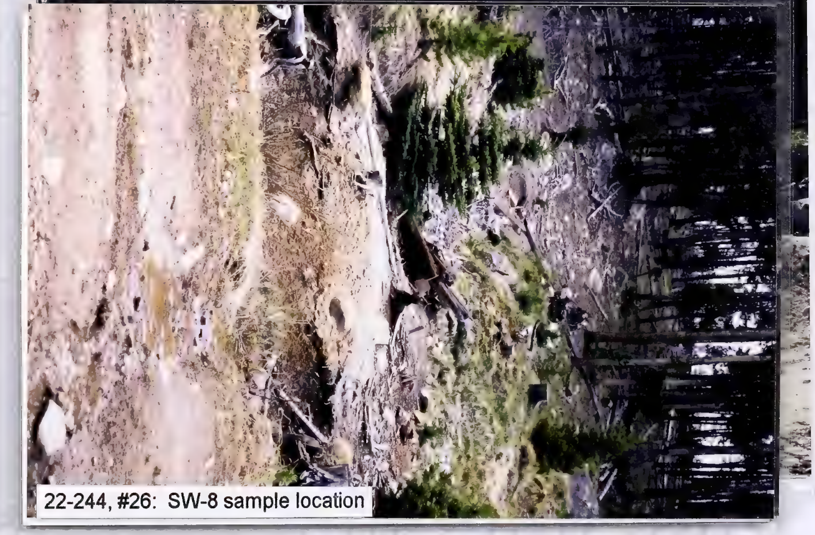

22-244, #13: South side of mill building

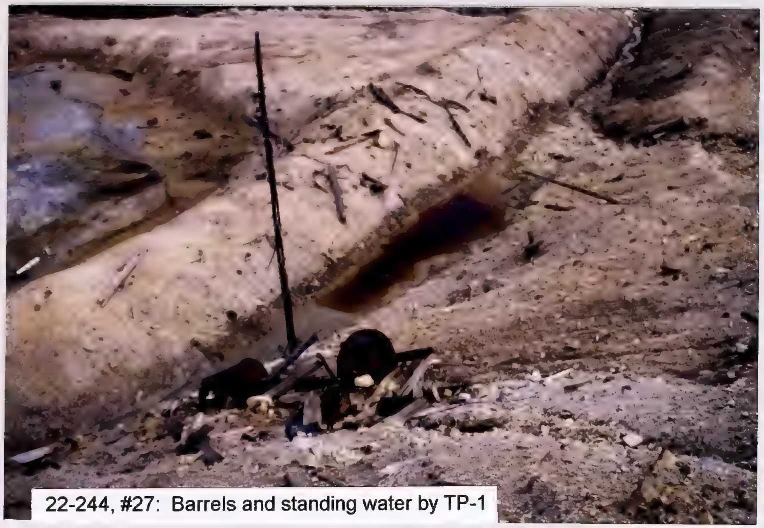

22-244, #14: Shaft #3


22-244, #23: GW-4 sample location

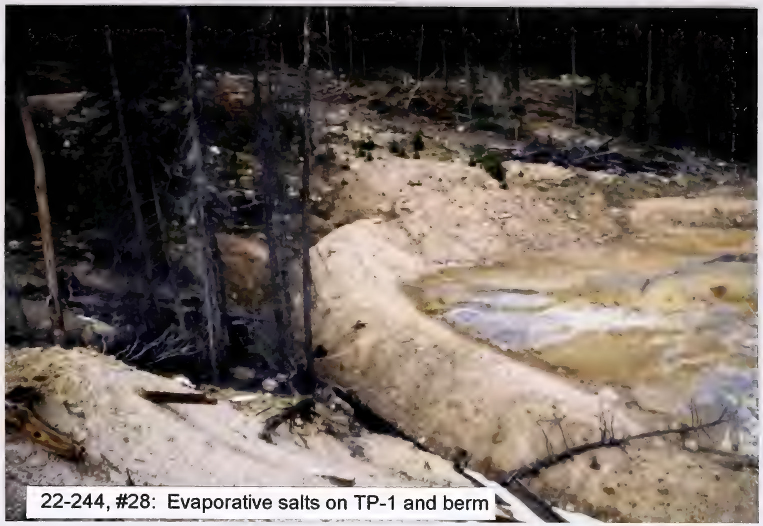

22-244, #24: SW-6 sample location


22-244, #25: Sample location downgradient Lump Gulch

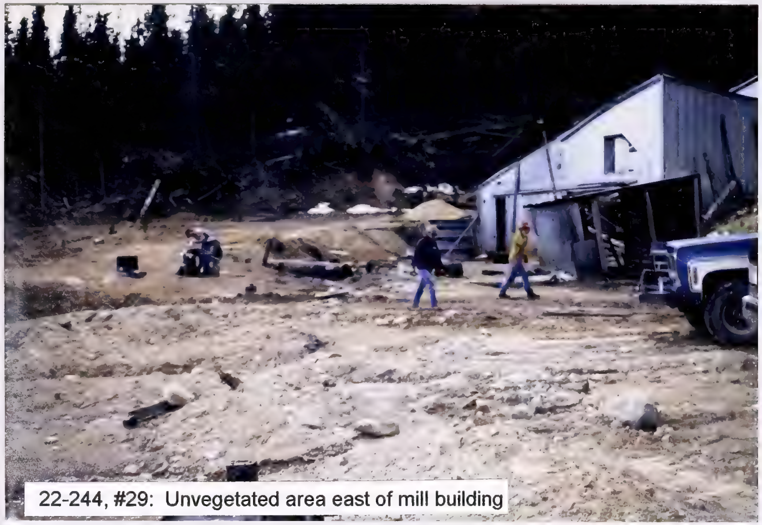

22-244, #26: SW-8 sample location



22-244, #27: Barrels and standing water by TP-1



22-244, #28: Evaporative salts on TP-1 and berm



22-244, #29: Unvegetated area east of mill building

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: GENERAL GRANT **PA#:** 22-245

Date: May 19, 1993 **Time:**

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Babits, Flammang, Lasher,
Clark; Pioneer
Pierson; TD&H

Visitors: None

Weather/Seasonality Observations: Partly cloudy; sunny; runoff season, some snow left; rain; cool.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #30: Shaft #1, GW-1 sample location; #31: WR-1 sample; #32: WR-1; #33: Source of WR-2; #34: WR-2 (yellow). Video Tape No. 2

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Backfill trenches and caved shaft with dump material. Amend and revegetate disturbed areas. Backfill open shaft with limestone if study of Nellie Grant site indicates the General Grant shaft is a source of contamination.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): GENERAL GRANT PA#: 22-245

Legal Description: T 8N ;R 5W ;Sec. 15 , SW1/4 SW1/4 1/4

County: JEFFERSON Mining District: CLANCY

Latitude: N 46° 26' 16" Longitude: W 112° 12' 07"

Primary Drainage Basin and Code: Lump Gulch/10030101
Secondary Drainage Basin: Lump Gulch

USGS Quadrangle map name(s): Chessman Reservoir

Mine Type/Commodities: Hardrock/Lead, Zinc

Activity Status: Active ___,Inactive/Exploration X ,Abandoned ___.

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact (Include address and phone when available): James Crawford and Lester Mirehouse, 1700 Sanders, Helena, MT 59601. (406) 442-7744; Helena National Forest.

Relationship to other mines/sites in the area/district: Adjacent to Nellie Grant mine

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Shaft #1 has been grated by the MDSL/AMRB.

General site features: Elevation 7000' , Slope 10°-20° ,
Aspect Southeast

Land use: Mining ___, Recreational X , Residential ___, Urban ___,
Agricultural ___, Other(Specify) ___

Area of disturbed/unvegetated lands? 2.6 acres.
Dimensions: Approx. 500 feet x 225 feet

Predominant vegetation types: Douglas fir, Lodgepole pine, grouse whortleberry, bear grass, blue bunch wheat grass

Access: roads - good X , poor ___, 4wd X , trail ___
Other logistical considerations (proximity to other sites): Access road through Nellie Grant.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Veins in highly sericitized Butte quartz monzonite. Site lies near wetlands associated with Frohner Meadows and also lies near the headwaters of the perennial stream, Lump Gulch. Groundwater levels at the nearby Nellie Grant site are approx. 30' bgs in the shaft; and at 2'-9' and at 24'+ in a downgradient monitoring well.

Mining/milling history, ore type/tenor, host rock, gangue: Stringers in a near vertical vein of milky quartz with much sphalerite and pyrite, and some galena. Wall rock of the vein is alaskite. Ore was milled at the Nellie Grant site.

Mine Operation?

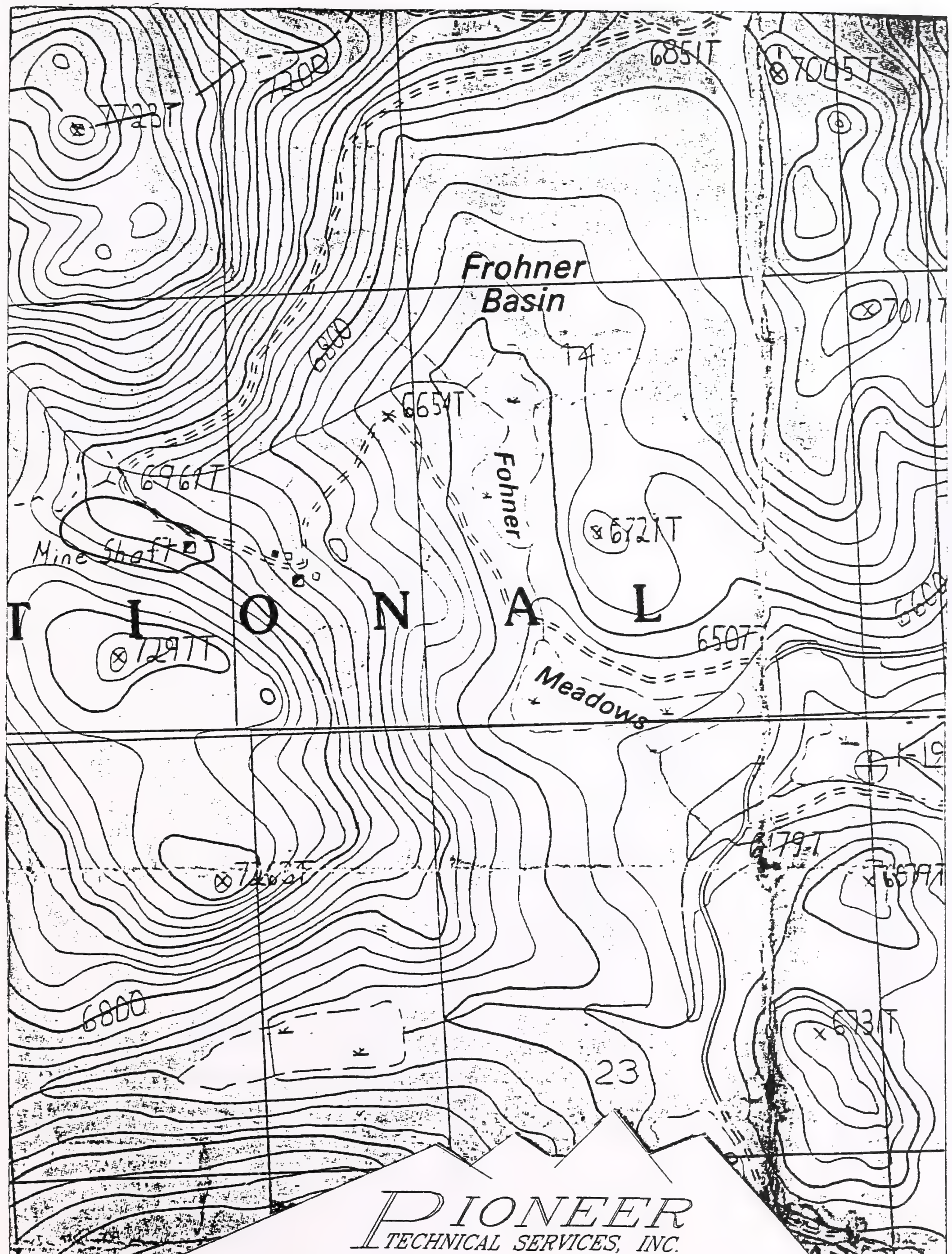
Shafts - Yes X, No ___, # 1, Comment Open (covered w/ grate)
Adits - Yes X, No ___, # 1, Comment Collapsed
Pits - Yes X, No ___, # 4, Comment All shallow
Placers - Yes ___, No X, # ___, Comment ___
Other - Yes X, No ___, # 4, Comment Trenches

Mill Operation? Yes ___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: N/A

Process? Hg-amalgam, CN$^-$ leach (vat, heap), floatation, smelting?
N/A

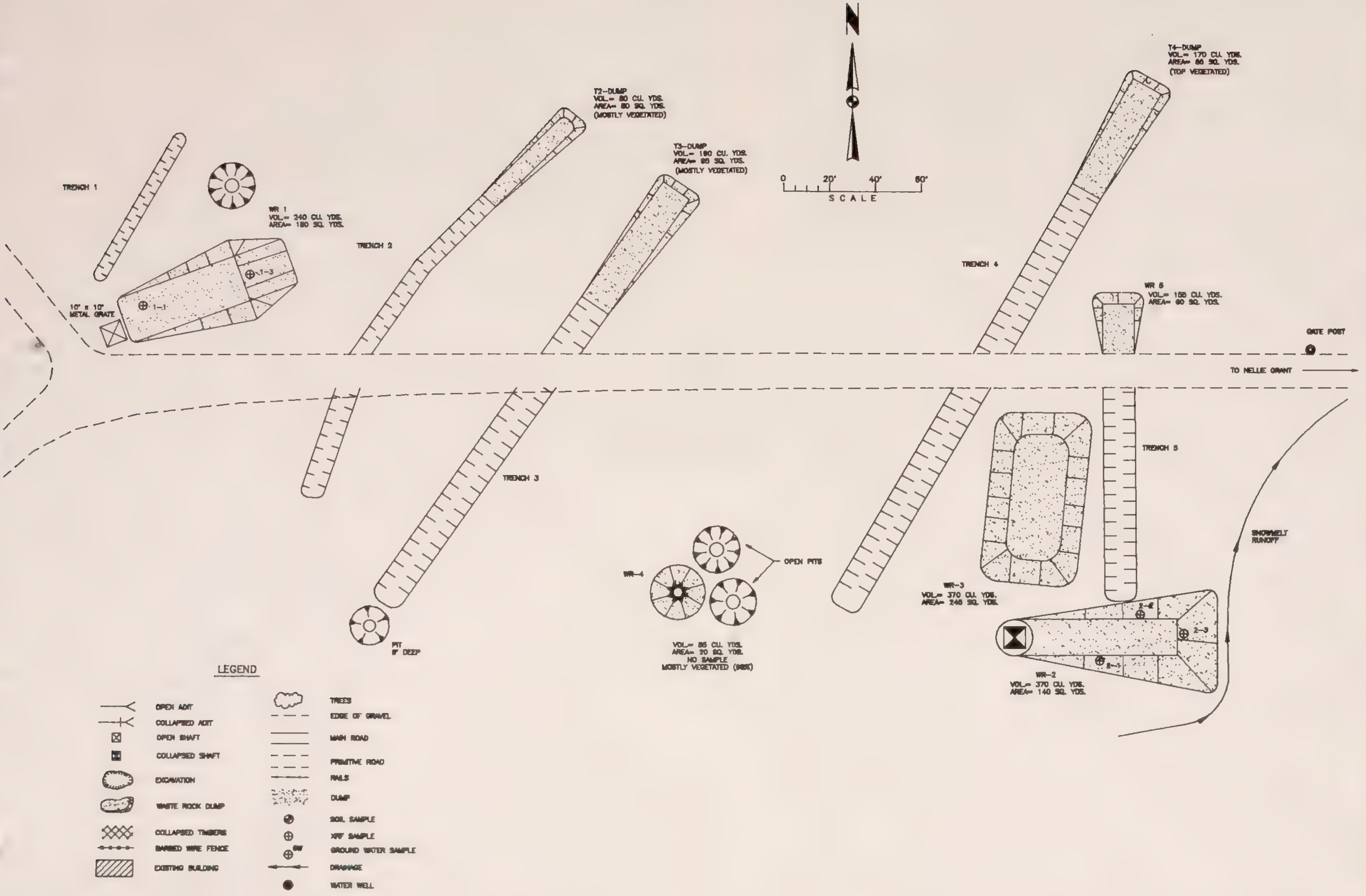


PIONEER TECHNICAL SERVICES, INC.

GENERAL GRANT, P.A. NO. 22-245

T08N, R05W, SECTION 15

SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

GENERAL GRANT PA# 22-245
CLANCY DISTRICT JEFFERSON COUNTY

PIONEER TECHNICAL SERVICES, INC. BUTTE, MT.

DRAWN JTP DATE 23 JUNE 93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

TDSH
THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS-BOZEMAN-KALISPELL MONTANA
SPOKANE WASHINGTON

SHEET NO.

22-245.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Pierson, Flammang

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd³)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1-1	WR	240	Assoc. with Shaft #1; near shaft	None	NM	NM	22-245-WR-1	05/19/93 1900	T-Metals, ABA
WR-1-3	WR		Assoc. with Shaft #1; off end of dump	None	NM	NM			
WR-2-1	WR	370	Yellow dump above cabins in new exploration area; southwest end	None	NM	NM	22-245-WR-2	05/19/93 1920	T-Metals, ABA
WR-2-2	WR		Yellow dump above cabins in new exploration area; north side near middle	None	NM	NM			
WR-2-3	WR		Yellow dump above cabins in new exploration area; east end above stream	None	NM	NM			
WR-3	WR	370	Pile between Trench #4 and Trench #5	None	N/A	N/A	N/A	N/A	N/A
WR-4	WR	55	Pile assoc. wit pits between Trench #3 and Trench #4	None	N/A	N/A	N/A	N/A	N/A
T-2	WR	80	Second trench east	None	N/A	N/A	N/A	N/A	N/A
T-3	WR	140	Third trench east	None	N/A	N/A	N/A	N/A	N/A
T-4	WR	170	Fourth trench east	None	N/A	N/A	N/A	N/A	N/A
T-5	WR	155	Fifth trench east	None	N/A	N/A	N/A	N/A	N/A

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-245-WR-1 is composite of WR-1-1 and -1-3. 22-245-WR-2 is composite of WR-2-1 through -2-3. NM = Not Measured

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:________

Filled shafts: Yes X , No___, Number: 1 Identification: Shaft #1

Seeps/Springs: Yes___, No X , Number:____ Identification:________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 62

Distance to nearest well used for drinking? Approx. 4 miles

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seep/Spring (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible X , Unlikely____.
Uncontained sources and groundwater in the open shaft.

Other observations/notes: Shaft #1 covered by grate that is locked and cemented to soil but access with bailer between soil and grate.

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L at $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
GW-1	SH	Shaft #1 at General Grant	N/A	6.47	100	NM	8.5	106	3.2' bgs SWL	22-245-GW-1	05/19/93 1340	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): NM = Not Measured

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes____, No X , Name(s):

Dry streambeds: Yes____, No X , Name(s):

Other surface water: Yes X , No___, Name(s)/Description: In a number of trenches, standing water is present which is exiting. Also, snow melt runoff is flowing down the road.

Waste materials within any floodplain: Yes____, No X Source ID(s):

Approximate Flood frequency?___1 yr,___10 yr,___100 yr

Estimated seasonal flow of stream(s) (cfs)? N/A
High Flow:________, Average Flow:________

Distance between waste source(s) and nearest surface water body (ft)? Frohner Meadows (Beaver Ponds) is approx. 1 mile from site.

Surface water draining onto or through waste sources: Yes X , No____,
Describe: Only collected runoff that exits after standing

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetlands, possible limited fisheries, stockwatering, irrigation

Observed erosional/sedimentation/stream turbidity problems? Yes___,
No X , Distance downstream (ft)?______ Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):

SURFACE WATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.											

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Nellie Grant mine site could be available for treatment; approx. 50 acres

Wetlands present: Yes X , No ___, Describe: But these are below Nellie Grant site in the Frohner Meadow

Carbonate rocks/soils: Yes ___, No X , Describe: ________

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100 X ; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments ________

Nearest residence(ft or miles)? Approx. 4 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Flammang, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	SO4	Dry	1,620	1,620	Yes	Low
WR-2	SO4	Dry	1,260	1,260	Yes	Low
WR-3	None	Dry	2,200	2,200	Yes	Low
WR-4	None	Dry	180	180	Yes	Low
WR-5	None	Dry	540	270	Yes	None
TP-2	None	Dry	720	360	Yes	None
TP-3	None	Dry	855	430	Yes	None
TP-4	None	Dry	765	380	Yes	None
GW-1	None	N/A	N/A	N/A	N/A	N/A

Notes and Clarifications: ______

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_, Describe:________________________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments_ None________________________________

Evidence of recreational use on site: Yes___, No_X_, Describe:_ Logging is occurring in the area.________________________

Accessibility - Fences, warning signs, closed roads?__ Unrestricted; gate posts are present.________________________

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment________________
Wilderness Area - Yes___, No_X_, Comment________________
T&E Species Habitat - Yes___, No_X_, Comment________________
Bat Habitat - Yes___, No_X_, Comment________________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _4_
Sport Fishery Classification - _4_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No_X_, Number____, types and locations:___ Shaft #1 is grated.________________________

Hazardous structures: Yes___, No_X_, Number____, types and locations:_________________________

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:_ Open pits are apparently stable.________________________

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_, Number____, types and locations:________________________

Fire and/or Explosion hazards: Yes___, No_X_, Explain:________________________

Bibliography

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LABORATORY ANALYTICAL DATA

GENERAL GRANT
PA NO. 22-245

General Grant PA# 22-245
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER - BULLOCK
INVESTIGATION DATE: 05/19/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-245-WR-1	2320	55.6	3.4	1.26 U	1.05 U	112	10300	0.244 J	79.5	1.84 U	3810	3.84 UJ	444	NR
22-245-WR-2	5130	44.4	1.9	1.12 U	2.42 J	55.4	7970	0.572 J	2.8	1.64 U	5400	4.1 J	66	NR
BACKGROUND	10	52.7	1.3	3.15	2.23 J	6.12	6390	0.035 J	284	2.6	21.9	3.4 UJ	43.6	NR

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-245-WR-1	0.59	18.4	-4.75	-23.2	0.51	0.02	0.06	0.62	-5.37
22-245-WR-2	0.51	15.9	-2.46	-18.4	0.47	<0.01	0.05	0.00	-2.46

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-245-GW-1	10.7	46.7	6.3	5.99 U	5.67 J	1.87 J	693	0.14 J	568	8.78 U	17.2	18.3 U	773	33.8

U - Not Detected; J - Estimated Quantity; X - Outlier for Accuracy or Precision; NR - Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-245-GW-1	95	< 5.0	26	18	NR

LEGEND

WR1 - Composite of subsamples WR1-1 and 1-3.
WR2 - Composite of subsamples WR2-1, 2-2, and 2-3.
BACKGROUND - From the Nellie Grant Mine (22-244-SS-1).
GW1 - Discharge from shaft #1 at General Grant.

XRF ANALYSIS RESULTS

GENERAL GRANT
PA NO. 22-245

MDSL AMRB/PIONEER 4/9/93

Mine Name: General Grant PA# 22-245
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-245-WR1-1		20813.9	393.389 *	201.764 *			8830.36			135.581 *		7.06091 *
22-245-WR1-3		41243.1	428.69 *	778.053			16443.3			299.846	3422.82	9.71888 *
22-245-WR2-1		19176.7	189.794 *	234.545 *			12934.5			118.459 *	5539.18	93.6545
22-245-WR2-2		1685.5	125.745 *		112.547		10538.2			105.947 *	7769.09	28.9421 *
22-245-WR2-3	*	37861.3 *	503.266 x	760.261			10374.8			203.088	436.816	158.207
22-245-WR-1-COMP		34857.9	1584.36	673.806		401.82 *	18891.3		90.968 *	542.903	2372.25	31.6473 *
22-245-WR-2-COMP		42133.2	1701.21	624.225			15453			167.072 *	6870.87	168.169

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-245-WR1-1	89.3478	46.5332 *		133.812	151.734		123.598 *	428.547			
22-245-WR1-3	89.9289	80.7706 *		1989.77	202.78			673.785			
22-245-WR2-1	101.839	57.3401 *		4537.42	222.963		115.245 *	279.72			
22-245-WR2-2	21.0076			3044.97	94.1165	251.511 *	245.392 *	148.083			
22-245-WR2-3	106.995		2.95752	3243.37	274.756	117.045	95.284	252.991			
22-245-WR-1-COMP	99.5475		11.3414 *	5439.29	235.395			401.648			
22-245-WR-2-COMP	97.234			6146.73	329.38			259.568			

* -- Estimated Quantity
$ -- Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

GENERAL GRANT
PA NO. 22-245

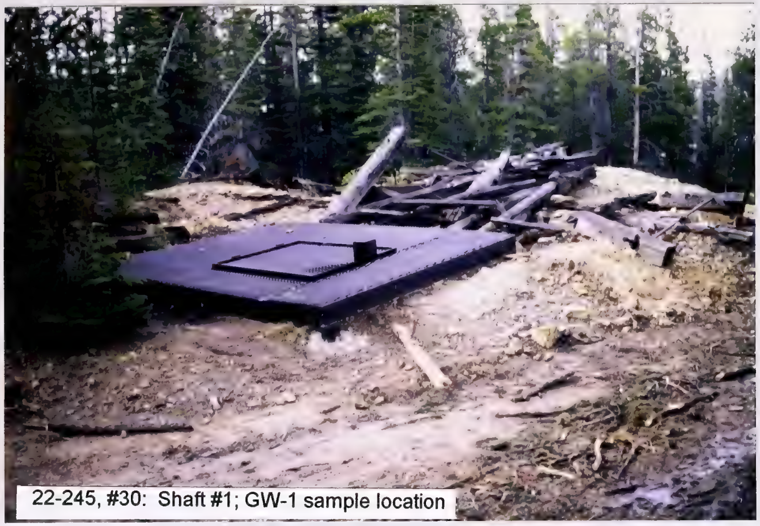
AIMSS SCORESHEET

SITE NAME: GENERAL GRANT
PA NUMBER: 22-245

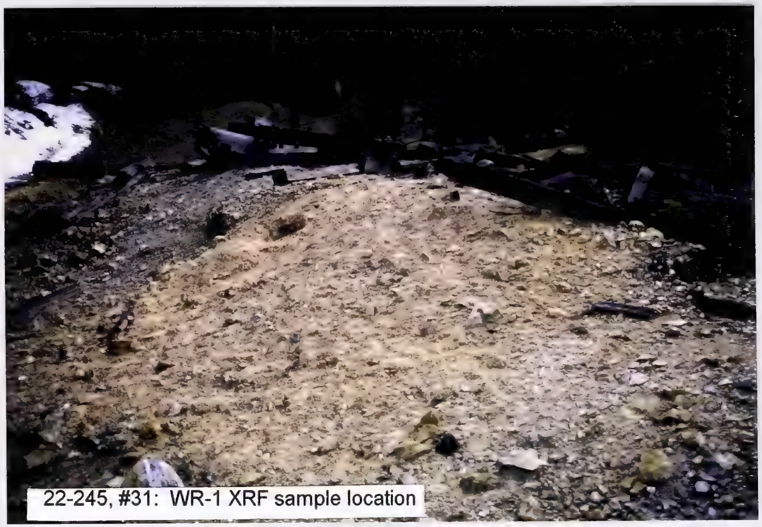
LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.760
6	GW - TARGETS	WELLS - 1 MI. x 2.5		22.5
7		WELLS - 1 TO 4 MI		53
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	75.5
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	113552
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
12		EXCEEDENCES		0
13A		CONTAINMENT		20
13B		DISTANCE TO SW		2
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	40
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	40
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	3.963
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		0
19		FISHERY		1
20		RECREATION		0
21		IRRIGATION/STOCK		0
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	1
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	159
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.175
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	40
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	350
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.166
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE**	(LINES 10 + 24 + 35 + 44) / 100,000		**1.14**

SITE NAME: GENERAL GRANT
PA NUMBER: 22-245

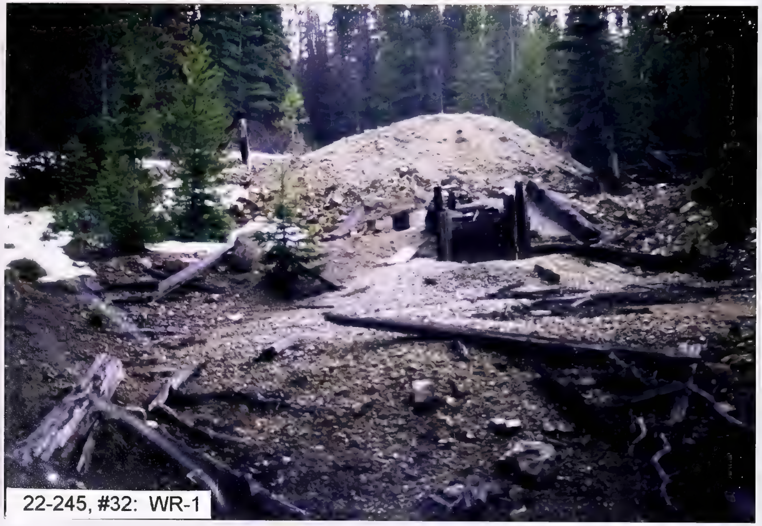
LINE NO.		SITE SAFETY		
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	[illegible]
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	0
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**



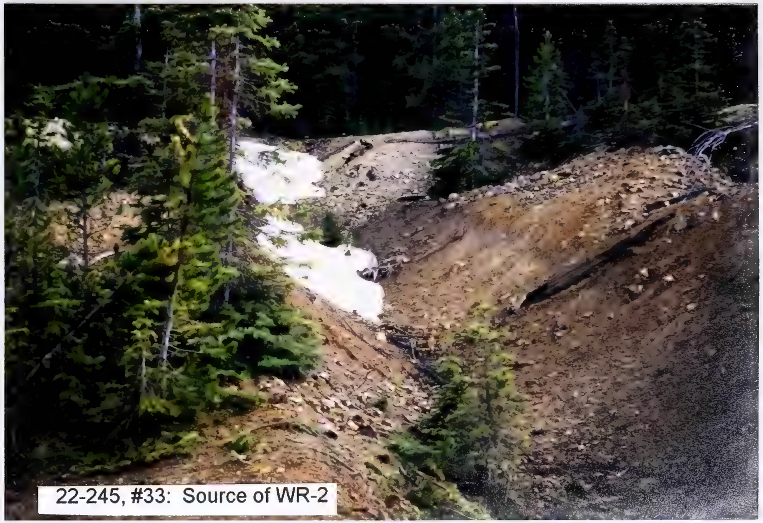
22-245, #30: Shaft #1; GW-1 sample location



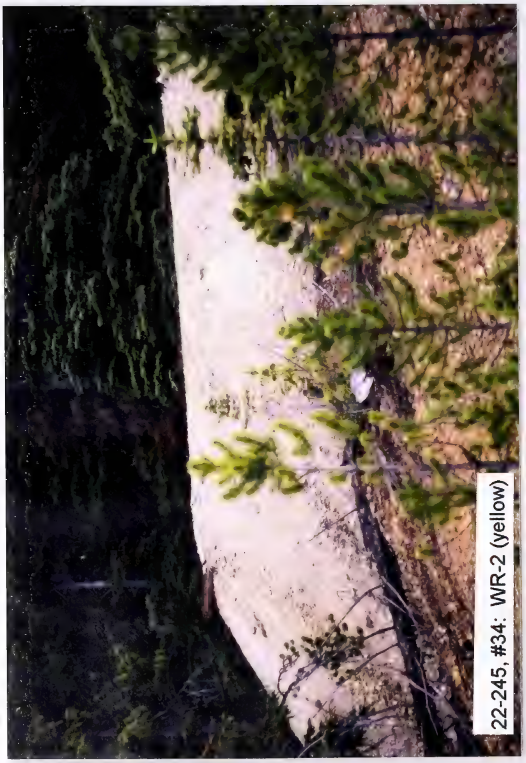
22-245, #31: WR-1 XRF sample location



22-245, #32: WR-1



22-245, #33: Source of WR-2



22-245, #34: WR-2 (yellow)

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY
SITE INVESTIGATION LOG SHEET

Mine/Site Name: ALTA PA#: 22-001

Date: August 17, 1993 Time: 0950-1330

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Belanger, Pioneer
Pierson, TD&H

Visitors: Off-road vehicle riders

Weather/Seasonality Observations: Overcast; cool (60°F); cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #13: Open cut and WR-3; #14: WR-5, WR-6, and WR-7; #15: Main level looking west; #16: SW-1 area from WR-1; #17: WR-1; #18: Adit on main level.
Video Tape No. 5

General Comments/Observations (not covered specifically in attached Inventory Forms): N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Dumps require grading, amendments, and revegetation; construction of stabilized drainages is necessary through the dumps. Water discharging from the toe of WR-1 requires treatment; additional characterization and design is necessary.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): ALTA PA#: 22-001

Legal Description: T 7N ;R 4W ;Sec. 10 , SE1/4 NW1/4 ___1/4

County: JEFFERSON Mining District: COLORADO

Latitude: N 46° 22' 24" Longitude: W 112° 05' 12"

Primary Drainage Basin and Code: Prickly Pear/10030101
Secondary Drainage Basin: Spring Creek

USGS Quadrangle map name(s): Wickes

Mine Type/Commodities: Hardrock/Gold, Lead, Silver, Iron, Zinc, Copper

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact(Include address and phone when available): Montana Tunnels Mining, Inc., P.O. Box 176, Jefferson City, MT 59638. (406) 933-8314.

Relationship to other mines/sites in the area/district: Adjacent to the Gregory Mine, Wickes Tailings, and Corbin Flats; directly east of the active Montana Tunnels Project.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 5600' , Slope 15°-20° , Aspect Northeast

Land use: Mining X , Recreational X , Residential___, Urban___, Agricultural X , Other(Specify)___

Area of disturbed/unvegetated lands? 15 acres.
Dimensions:___

Predominant vegetation types: Lodgepole pine, douglas fir, aspen, grassy, open meadows.

Access: roads - good___,poor___,4wd X ,trail___.
Other logistical considerations (proximity to other sites).___

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 8 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). The site lies on the boundary of the Boulder Batholith; the mine was underlain by Elkhorn Mountain volcanics. The site lies in the headwaters of the intermittent Spring Creek; water leaving the site flows east-northeast to Spring Creek, which flows northeast away from the site.

Mining/milling history, ore type/tenor, host rock, gangue: The Alta lode was discovered in 1869; it operated from 1896 until 1910, and intermittently after that. Most production of ore was before 1902; however, from 1902 to 1957, production was recorded at 349,839 tons of ore which yielded 8,174 oz. Au, 1,165,299 ox. Ag, 546,286 lbs. Cu, 8,134,488 lbs. Pb, and 1,234,644 lbs. Zn. The ore body consists of lenses, veins, and replacement bodies of the minerals sphalerite, argentiferous galena, tetrahedrite, and pyrite.

Mine Operation?
Shafts - Yes X, No ___, # 1, Comment ___
Adits - Yes X, No ___, # 3, Comment ___
Pits - Yes ___, No X, # ___, Comment ___
Placers - Yes ___, No X, # ___, Comment ___
Other - Yes ___, No X, # ___, Comment ___

Mill Operation? Yes X, No ___. If yes answer the next three questions:

Period(s) of Operation: Mill is located at Corbin Flats; 1896 to 1957, intermittently.

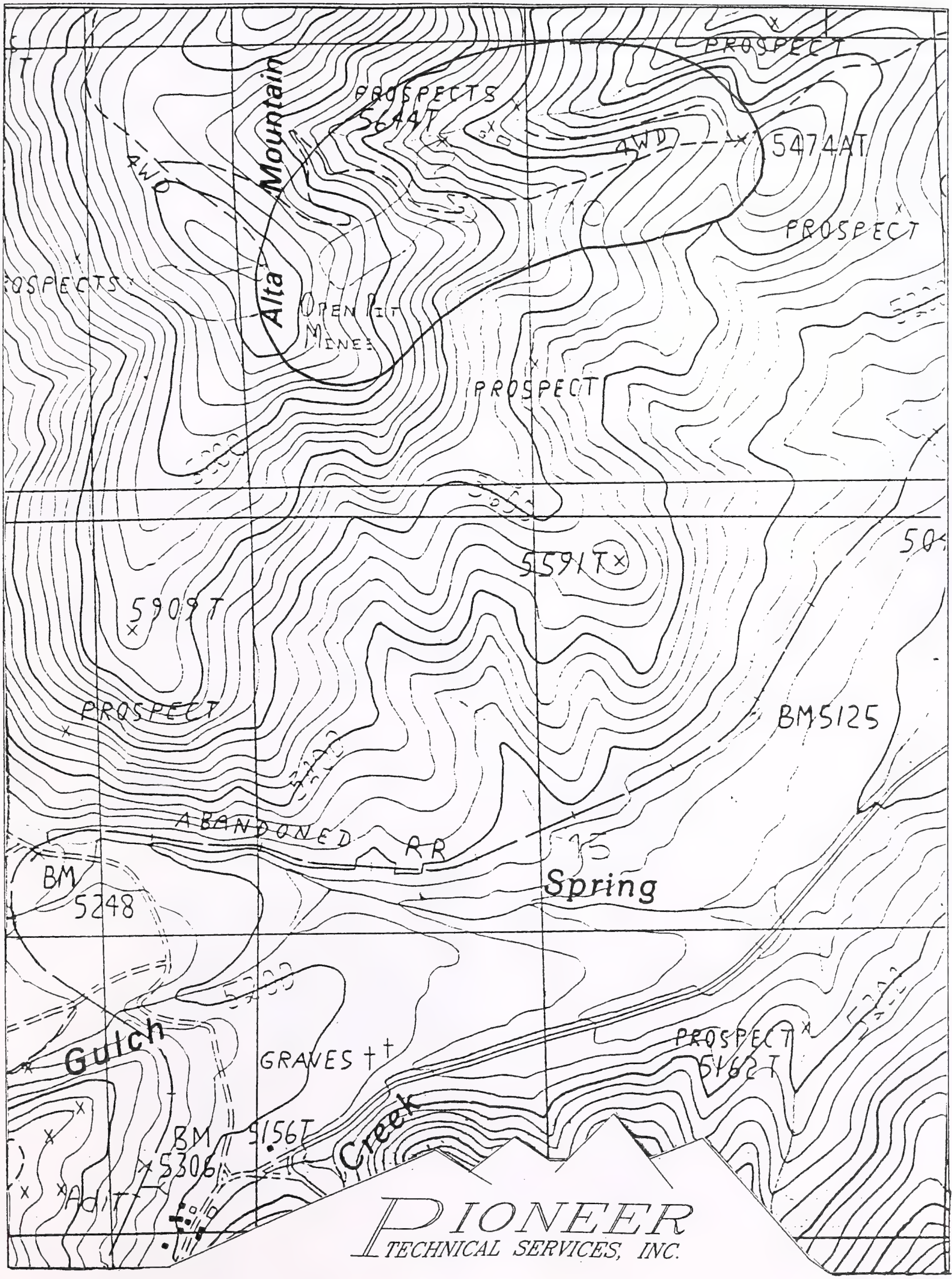
Origin of Ore Milled - Custom Mill ___ Dedicated Mill X; Number and names of mines that supplied mill feed: Bertha, Gregory, and Alta mines

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting?
Floatation

Montana Bureau of Mines and Geology
Water Well Log Data

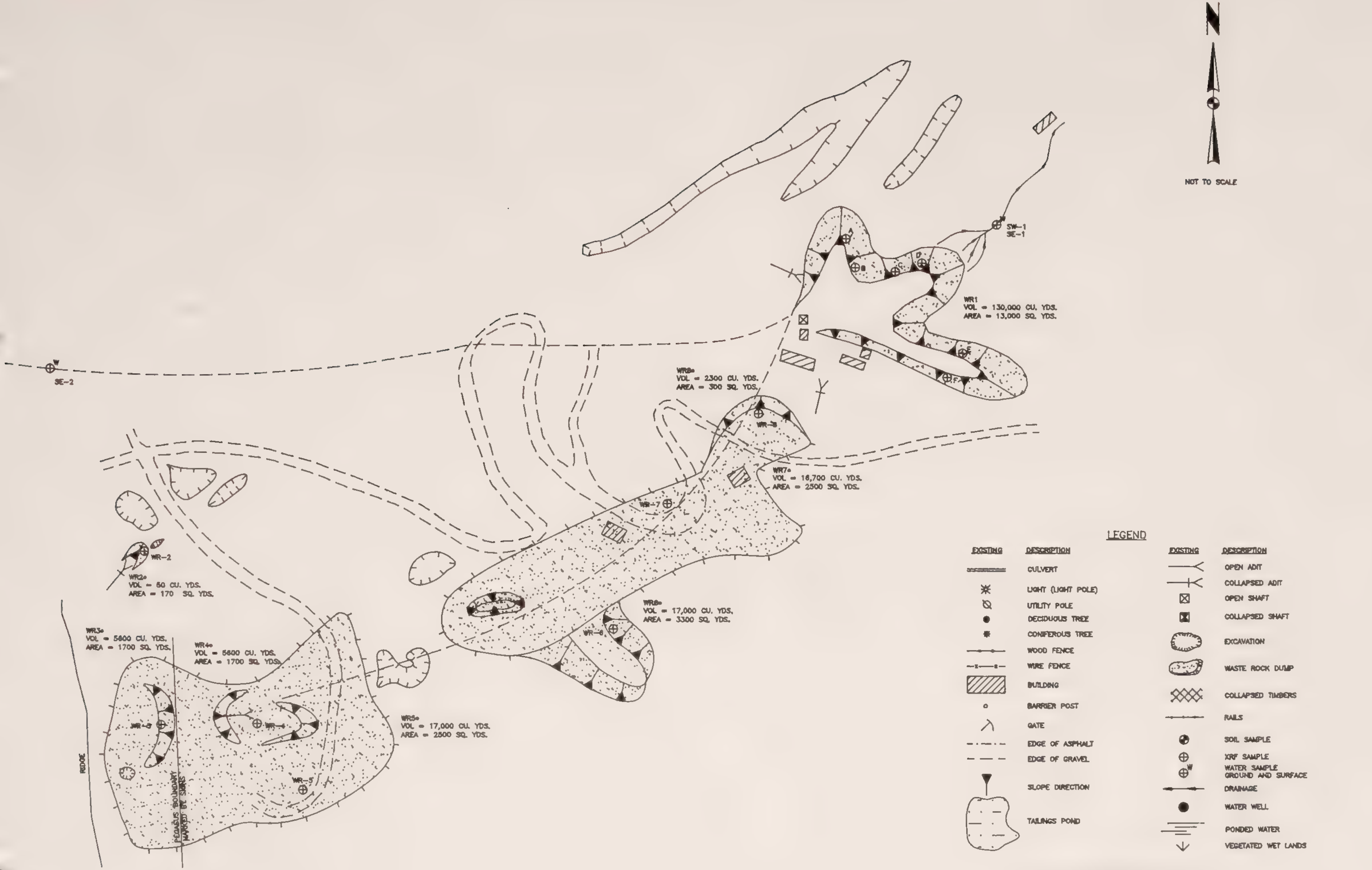
11/01/1993

Well No.	Location	Depth	Yield	Static Water Level
M:55781	07N 04W 02	65.0	1.0	0.00 ①
M:55782	07N 04W 02 B	0.0	100.0	12.00 ②
M:55783	07N 04W 02 BC	152.0	500.0	8.00 ③
M:55784	07N 04W 02 DD	38.0	10.0	15.00 ④
M:55785	07N 04W 03	95.0	8.0	35.00 ⑤
M:55786	07N 04W 03	70.0	30.0	20.00 ⑥
M:55787	07N 04W 03 DCA	95.0	8.0	35.00
M:55791	07N 04W 09 BA	300.0	120.0	15.00
M:55792	07N 04W 09 BAA	400.0	50.0	9.00
M:55793	07N 04W 09 BAD	149.0	70.0	45.00
M:55794	07N 04W 11 ACD	23.0	15.0	6.00 ⑦
M:55795	07N 04W 11 CA	54.0	40.0	6.00
M:5432	07N 04W 11 CDCD	84.3	0.0	7.34
M:55796	07N 04W 14 B	36.0	40.0	11.00 ⑧
M:55797	07N 04W 14 BA	200.0	75.0	31.00
M:55798	07N 04W 14 BA	600.0	500.0	18.00
M:5433	07N 04W 14 BBCC	79.0	0.0	27.53
M:5434	07N 04W 14 BBCD	269.0	0.0	25.46
M:5435	07N 04W 16 ACCA	53.1	0.0	39.15
M:5436	07N 04W 16 BBAA	48.7	0.0	26.57
M:5437	07N 04W 16 CDBB	298.7	0.0	66.05
M:5438	07N 04W 16 DBAA	93.1	0.0	73.42
M:5439	07N 04W 16 DBDA	124.0	0.0	113.92
M:5440	07N 04W 16 DCAA	233.0	0.0	15.61



PIONEER
TECHNICAL SERVICES, INC.

ALTA, P.A. NO. 22-001
T07N, R04W, SECTION 10
SCALE: 1" = 1000'



* NOTE: AREAS AND VOLUMES OF WR2 THROUGH WR8 ARE ROUGH APPROXIMATIONS

PLOT SCALE: 1 = 60
PT340703.DWG

DRAWN CAJ DATE REV 1/11/95
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

PIONEER
TECHNICAL SERVICES, INC. BUTTE, MT.

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS—BOZEMAN—KALISPELL MONTANA
SPOKANE WASHINGTON

TD&H

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

ALTA MINE SITE PA# 22-001
COLORADO DISTRICT JEFFERSON COUNTY

SHEETS	SHEET NO.
1	1

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Pierson

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)[*]	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	130,000	Associated with shaft; on NW lobe, on knob	None	4.5 (D)	0.04	22-001-WR-1	08/17/93 1515	T-Metals, ABA
WR-1B	WR		Associated with shaft; SSE of WR-1A on NW lobe	None	5.6 (D)	0.06			
WR-1C	WR		Associated with shaft; center lobe, W side	None	< 3.5 (D)	0.06			
WR-1D	WR		Associated with shaft; center lobe, near knob	None	4. 0 (D)	0.06			
WR-1E	WR		Associated with shaft; S lobe, N side	None	< 3.5 (D)	0.05			
WR-1F	WR		Associated with shaft; S lobe, S side	None	< 3.5 (D)	0.06	N/A	N/A	XRF Analysis
WR-2	WR	50	100 yd. from top of Alta Mountain	None	3.74 (S)	0.03	22-001-WR-2	08/17/93 1520	T-Metals, ABA
WR-3	WR	5,600	Pile associated with upper-most pit	None	2.69 (S)	0.045			
WR-4	WR	5,600	Waste rock associated with adit	None	3.51 (S)	0.045			
WR-5	WR	17,000	Large pile approx. 150 feet SE of WR-4	None	3.76 (S)	0.10	22-001-WR-3	08/17/93 1525	T-Metals, ABA
WR-6	WR	17,000	Waste rock present 1/2 way between second large open cut and house, NE corner of dump	None	3.30 (S)	0.07			
WR-7	WR	16,700	Below road; runs under house in drainage	None	3.29 (S)	0.02			
WR-8	WR	2,300	Dump approx. 75 feet below house	None	2.19 (S)	0.03			

[*] D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-001-WR-1 is composite of WR-1A through -1E. 22-001-WR-2 is composite of WR-2 through -4. 22-001-WR-3 is composite of WR-5 through -8. See Bertha Mine (22-002) for background sample. Volumes are rough estimates due to large area and complex terrain.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification: Evidence of seepage from Adit #1 during spring; not flowing at time of investigation.

Filled shafts: Yes___, No_X_, Number:____ Identification:____

Seeps/Springs: Yes_X_, No____, Number:_1_ Identification: Flow apparently from shaft seeps out of toe of WR-1; sampled as SW-1.

Groundwater wells within 5 miles?: Yes_X_, No___;
Number of well logs:_109_

Distance to nearest well used for drinking?_Approx. 1.25 miles_

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable_X_, Possible____, Unlikely____.
Large, uncontained sources containing elevated metal values. Water is flowing subsurface through the dump material.

Other observations/notes:_N/A_

GROUNDWATER INVENTORY FORM

SAMPLERS: ____________________

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X , No ___, Name(s): Unnamed tributary of Spring Creek

Dry streambeds: Yes ____, No X , Name(s): Additional smaller drainage bisects dumps WR-3, WR-4, and WR-5.

Other surface water: Yes ____, No X , Name(s)/Description:

Waste materials within any floodplain: Yes X , No ___ Source ID(s): Single stream partially flows through some of WR-1.

Approximate Flood frequency? X 1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)?
High Flow: 1-2 cfs , Average Flow: 10 gpm

Distance between waste source(s) and nearest surface water body (ft)?
0 feet

Surface water draining onto or through waste sources: Yes X , No ____,
Describe: Single stream partially flows through some of WR-1.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Agriculture; Prickly Pear Creek: wetlands, fishery, recreation, possible residential, irrigation.

Observed erosional/sedimentation/stream turbidity problems? Yes X , No _____, Distance downstream (ft)? >1000 Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Waste rock material has eroded into the drainage. Elevated metals concentrations are present greater than 1000 feet downstream of WR-1.

SURFACE WATER INVENTORY FORM

SAMPLERS: Pierson

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	At single stream below WR-1	2.59	420	469.4	12.0	0	10 gpm (E)	22-001-SW-1	08/17/93 1100	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	At single stream below WR-1	N/A	N/A	N/A	N/A	N/A	N/A	22-001-SE-1	08/17/93 1100	T-Metals
SE-2	SE	Upgradient of site	N/A	N/A	N/A	N/A	N/A	N/A	22-001-SE-2	08/17/93 1230	T-Metals
SE-500	SE	500 feet downgradient of site	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	1,000 feet downgradient of site	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

*FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ____________________

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 15 acres

Wetlands present: Yes___, No_X_, Describe:___

Carbonate rocks/soils: Yes___, No_X_, Describe:___

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100___; 100-300_X_; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments___

Nearest residence(ft or miles)? Approx. 1.25 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Pierson

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	SO3; FEOX; pH	Dry	117,000	105,000	Yes	Low
WR-2	SO3 (high); pH	Dry	170	150	No	None
WR-3	SO3 (high); FEOX; pH	Dry	15,000	15,000	Yes	Low
WR-4	Metals; pH	Dry	15,000	15,000	Yes	Low
WR-5	pH	Dry	22,500	22,500	Yes	Low
WR-6	pH	Dry	30,000	30,000	Yes	Low
WR-7	pH	Dry	22,500	22,500	Yes	Low
WR-8	SO3 (high); pH	Dry	2,500	2,500	Yes	Low

Notes and Clarifications: Areas are rough estimates due to large area and complex terrain.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:____________________

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments____________________

Evidence of recreational use on-site: Yes_X_, No___, Describe:_Off-road vehicle riders on-site during the investigation._

Accessibility - Fences, warning signs, closed roads?_Unrestricted_

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment____________
Wilderness Area - Yes___, No_X_, Comment____________
T&E Species Habitat - Yes___, No_X_, Comment____________
Bat Habitat - Yes___, No_X_, Comment____________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _3_
Sport Fishery Classification - _Not Rated_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1_, types and locations:_Shaft is possibly accessible._

Hazardous structures: Yes_X_, No___, Number_7_, types and locations:_Old mine buildings and houses_

Unstable highwalls, pits, trenches, slopes: Yes_X_, No___, Number_2_, types and locations:_Open pits with approx. 50' highwalls_

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_4_, types and locations:_Dumps associated with upper workings are unstable and eroding._

Fire and/or Explosion hazards: Yes_X_, No___, Explain:_Old structures_

Bibliography

Deckler, Jeffrey Harris, Characterization of Four Inactive Hard Rock Mines in Western Montana, Thesis for Montana State University, August 1982.

Delta Engineering, Data Summary: Alta Mine Discharge Monitoring, Prepared by Stiller and Associates, December 30, 1985.

MBMG, Mines and Mineral Deposits (Except Fuels), Jefferson County, Montana, Bulletin 16, Written by R.N. Roby, W.C. Ackerman, F.B. Fulkerson, and F.A. Crowley, June 1960, pp. 44-46.

MBMG, Well Log Database, September 8, 1993.

MDFWP, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

MDHES/WQB, Nonpoint Source Stream Reach Assessment, Field Report Form, July 31, 1992.

MDSL/AMRB Files, Abandonded Mine Lands National Inventory, Phase II Problem Area Data Form for the Alta Mine South Slope, Alta North Upper Dump, and Alta North Lower Dump, Prepared by Mark Carlstrom and Ben Mundie, September 13 and 14, 1979.

MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Alta Mine, Prepared by Delta Engineering, Date Unknown.

MDSL/AMRB, Abandoned Mine Reclamation Inventory Field Form for the Alta Mine, Prepared by Northern Engineering and Testing, June 30, 1988.

MDSL/AMRB, Analytical Data for Alta Mine, Prepared by Northern Engineering and Testing, June 25 and 27, 1984.

USGS, Topographic Map, Wickes, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

ALTA
PA NO. 22-001

MDSL AMRB/PIONEER 4/9/93

Alta PA# 22−001
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER − BULLOCK
INVESTIGATION DATE: 08/17/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22−001−SE−1	821 J	97.4 J	1.3 J	2.8 J	4.1 J	230 JX	49900 J	0.12	291 J	6 J	1170 J	6 U	613 JX	NR
22−001−SE−2	46 J	120 J	0.5 U	5 J	8.9 J	32.3 JX	14300 J	0.049	761 J	10 J	96 J	6 U	120 JX	NR
22−001−WR−1	249 J	67.1 J	0.5 U	1.8 U	2.4 J	217 JX	30100 J	0.428	291 J	4 J	3940 J	6 U	366 JX	NR
22−001−WR−2	658 J	61.5 J	1.1 J	1.7 U	1.2 U	193 JX	23700 J	0.366	18.3 J	2 J	15100 J	5 U	328 JX	NR
22−001−WR−3	293 J	57 J	0.6 J	1.9 U	1.3 U	122 JX	12800 J	0.437	710 J	39 J	3100 J	6 U	205 JX	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22−001−WR−1	2.8	87.5	−0.6	−88.	2.62	0.03	0.15	0.94	−1.58
22−001−WR−2	2.88	90	−3.0	−93	0.94	1.26	0.68	39.4	−42.4
22−001−WR−3DUF	0.88	27.5	−1.4	−28.	0.84	<0.01	0.05	0	−1.44
22−001−WR−3	0.87	27.2	−1.6	−28.	0.82	<0.01	0.06	0	−1.62

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22−001−SW−1	1270	2.01 U	892 J	206	78.5	16200 J	368000	0.21 J	390000	117	26.3	329	289000	1230

U − Not Detected; J − Estimated Quantity; X − Outlier for Accuracy or Precision; NR − Not Requested; ND − No Data

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2−N	CYANIDE
22−001−SW−1	5810	ND	3450	< 0.05	NR

LEGEND

SE1 − At single stream below waste rock dump 1.
SE2 − Upgradient of site.
WR1 − Composite of subsamples WR1A, 1B, 1C, 1D, and 1E.
WR2 − Composite of subsamples WR2, 3, and 4.
WR3 − Composite of subsamples WR5, 6, 7, and 8.
BACKGROUND − From the Bertha Mine (22−002−SS−1).
WR3DUP − Duplicate of sample 22−001−WR−3.
SW1 − Same as sample SE1.

XRF ANALYSIS RESULTS

ALTA
PA NO. 22-001

Mine Name: Alta PA# 22-001
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-001-SE-1000		22750.6	3358.35	1974.55		1462.7	66557.3	698.119 *	215.848	652.038	901.297	187.308
22-001-SE-500		20052.5	2832.81	1816.9		870.588 *	49537.5	430.801 *	250.643	568.508	970.556	163.055
22-001-WR1-A		22598.4	29130.9	592.572			48547.9		95.2697 *	256.575		72.5259
22-001-WR1-B		27756.6	10434.5	1161.7		660.833 *	46755.7	398.114 *	228.847	302.433	213.526 *	87.5034
22-001-WR1-C		22861.3	38434.4	1246.87		319.279 *	33446.5			306.031	149.88 *	152.85
22-001-WR1-D		35713.9	19042.1	2230.59		2107.3	35606	288.505 *	166.871 *	1077.05		344.178
22-001-WR1-E		40560.3	30573.6	2085.66		560.997 *	41462.9		270.292	311.102		141.638
22-001-WR1-F		34435.9	11639.3	2185.11		491.194 *	30137.6		104.869 *	77.3234 *		115.058
22-001-WR-1-COMP		24415.5	25945.8	1164.87		896.273 *	38466.7		168.309 *	361.002		125.964
22-001-WR-2		25684.1	1696.58	829.081		747.005 *	34693	360.091 *	191.263 *	334.576		31.0211 *
22-001-WR-2-COMP		25208.1	1439.86	915.329		331.987 *	25253.7	300.759 *	169.391 *	314.58		35.124
22-001-WR-3		31135.8	1341.36	1398.19		431.782 *	19590.2	277.704 *	209.421	163.376		27.7535
22-001-WR-3-COMP		25912.3	3404.28	1806.23		1345.62	38158.9		286.929	517.771	271.284 *	127.485
22-001-WR-4		21661.1	1700.36	807.715		529.589 *	25050	249.044 *	316.252	651.759		57.1217
22-001-WR-5		26495.8	1525.73	1027.36		1121.79	30596.3		245.087	672.817		60.657
22-001-WR-6		24541	1601.9	1617.51		489.094 *	34290.8		270.248	336.861		152.968
22-001-WR-7		18484.1	2808.38	1554.47		5501.11	49645.7		201.927	522.722	1242.7	219.508
22-001-WR-8		29199.3	5446.26	1604.44		853.653 *	34190.2		279.832	471.65		63.9215

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-001-SE-1000	265.115			947.127	183.954			653.493			
22-001-SE-500	242.847			1581.57	191.574			598.951	121.944 *		
22-001-WR1-A	174.443			3294.83	230.157			387.102	112.853 *		13.6093
22-001-WR1-B	219.848			5240.79	280.43		87.9217 *	472.423	161.328 *		16.7219 *
22-001-WR1-C	191.914			1661.07	312.36			351.065			
22-001-WR1-D	247.813			645.812	205.282	180.276 *		803.328	149.956 *		19.3487
22-001-WR1-E	238.63			4231.67	307.51	294.708 *		458.321	193.854 *		16.5703
22-001-WR1-F	276.509			21.9234 *	254.385			747.245	97.3695 *		16.894
22-001-WR-1-COMP	183.605			3554.69	276.852		68.2168 *	429.499	106.918 *		18.2422
22-001-WR-2	150.758			13818.8	190.942		763.376	308.076	294.749 *		40.4708
22-001-WR-2-COMP	177.531			9102.06	196.186		398.649	262.251	183.05 *		
22-001-WR-3	192.679			3900.96	240.233		96.559 *	317.321	97.6612 *	19.0987 *	17.7798
22-001-WR-3-COMP	253.66			5170.66	258.367		139.552 *	601.627	88.3952 *		15.8184
22-001-WR-4	177.302			11067.9	210.628		457.559	321.55	262.26 *		
22-001-WR-5	198.144			6373.84	257.104		145.111 *	528.05			22.5723
22-001-WR-6	222.634			7483.56	243.026		258.976	607.679	140.511 *		23.7895
22-001-WR-7	243.355			790.039	178.685			689			9.2224
22-001-WR-8	240.062			6127.29	296.422		113.277 *	433.821			

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

ALTA
PA NO. 22-001

MDSL AMRB/PIONEER 4/9/93

AIMSS SCORESHEET

SITE NAME: ALTA
PA NUMBER: 22-001

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		10
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	200
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	200
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	590.406
6	GW - TARGETS	WELLS - 1 MI. x 2.5		20.0
7		WELLS - 1 TO 4 MI		101
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	121.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	14287825
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	648.018
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		1
18		WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	23
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	11923531
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	5.870
29	AIR - TARGETS	POPULATION - 4 MILES		100
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	110
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	32285
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	150
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	5.347
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 - 42	11
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	8823
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE**	(LINES 10 + 24 + 35 + 44) / 100,000		**262.52**

SITE NAME: ALTA
PA NUMBER: 22-001

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	150
5		HAZ. STRUCTURES	40 EA.	280
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	530
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 - 11	11
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**116.60**

SUMMARY OF HISTORICAL ANALYTICAL DATA FROM OTHER SOURCES

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E HEALTH DEPT.          WATER QUALITY BUREAU           HELENA, MONTANA  59601

     STATE    MONTANA                                    COUNTY   JEFFERSON
 LAT.-LONG.   462243N 112 435W              SAMPLE LOCATION    7N   4W   2CCC
TATION CODE                                 ANALYSIS NUMBER   80W0511
ATE SAMPLED   04-16-80                        DRAINAGE BASIN   0411 -U MISSOURI
IME SAMPLED   1445                            WATER FLOW RATE          .15CFS(M)
HOD SAMPLED   GRAB                   FLOW MEASUREMENT METHOD   FLOW METER
MPLE SOURCE   STREAM                    ALTITUDE OF LAND SURFACE
  WATER USE   UNUSED                 TOTAL WELL DEPTH BELOW LS
 AQUIFER(S)                             SWL ABOVE(+) OR BELOW LS
 SAMPLED BY   WQBH                   SAMPLE DEPTH BELOW SURFACE

     SAMPLING SITE: CORBIN CREEK ABOVE ALTA MINE DRAINAGE

                 MG/L       MEQ/L                              MG/L       MEQ/L
ALCIUM (CA)      68.5       3.418   BICARBONATE(HCO3)         73.3       1.202
NESIUM (MG)      24.7       2.032     CARBONATE (CO3)          0.0         0.0
SODIUM (NA)                            CHLORIDE   (CL)
ASSIUM  (K)                             SULFATE (SO4)        227.0       4.726
                                       FLUORIDE    (F)
                                   PHOSPHATE(PO4 AS P)
                                     NO3+NO2 (TOT AS N)

                 -----      -----                             -----      -----
 SUM CATIONS     93.2       5.450          SUM ANIONS        300.3       5.928

            LABORATORY PH       8.59     TOT HARDNESS(MG/L-CACO3)     273
D WATER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)     60
M-DISS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (NTU)     470.
B CONDUCTIVITY-UMHOS-25C    586.0          SODIUM ADSORPTION RATIO

               A D D I T I O N A L    P A R A M E T E R S
DIMENT,TOT,SUSP (MG/L)    965.          COPPER,TR (MG/L AS CU)       3.72
  ZINC,TR (MG/L AS ZN)          .22         IRON,TR (MG/L AS FE)   268.
NGANESE,TR(MG/L AS MN)        1.05                    PH,FIELD(SU)    7.9
NC, DISS(MG/L AS ZN)            .22     COPPER, DISS(MG/L AS CU)       .02
RON,FERROUS,DISS (MG/L)         .01     MANGANESE,DISS(MG/L-MN)        .62

MARKS:  SPRING CREEK SURVEY        NO T.TAKEN

PLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
MPLE NO 12        SAMPLER  GLI     HANDLING 4210    ANALYST   CW    LAB  WQBH
MPLETED 10-14-80  COMPUTER RUN 10/16/80  DATA 0975/PROG 0876 FUND 5053
ND DEV. ION BALANCE  2.68        CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
SMENT        MPOES              62.7 37.3  0.0  0.0  0.0 79.7 20.3  0.0  0.0
LC. MEQ/L= INSUFFICIENT DATA                                          80W0511
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UALITY BUREAU-MONT STATE HEALTH DEPT.            HELENA, MONTANA  59601
                              WATER QUALITY ANALYSIS

        STATE  MT                                      COUNTY JEFFERSON
 E-LONGITUDE                                         LOCATION  07N 04W 11B
 SAMPLE TYPE  STREAM                                  LAB NO.  74 1905
 ICAL SOURCE                           SAMPLE OR BOTTLE NO.  002
 INAGE BASIN  411                    AGENCY AND STATION CODE  WQB
 ATE SAMPLED  07-03-74               DEPTH WATER ENTERS WELL
 IME SAMPLED  1000                  SWL ABOVE(+) OR BELOW GS
 TE ANALYZED  07-18-74              ALTITUDE OF SAMPLE POINT
 LE HANDLING  110                            WATER FLOW RATE        5.0  GPM(E)
 HOD SAMPLED  BOTTLE                        FLOW MEAS METHOD
 Y CONDITION  3                      PRINCIPAL USE OF WATER  MULTIPLE

    PROJECT  MISSOURI-SUN-SMITH WQM STUDY    MTHDWQ  BRAICO
    REMARKS  OTRIB TO SPING CR AT JCT W/ MINE TLGS CR 0.3 MI AB RR
             (E. FR CORBIN CR)
ARAMETERS REPORTED IN MILLIGRAMS PER LITER EXCEPT AS INDICATED
              MG/L      MEQ/L                                  MG/L      MEQ/L
IUM (CA)                           BICARBONATE(HCO3)
IUM (MG)                             CARBONATE (CO3)
IUM (NA)                             HYDROXIDE  (OH)
IUM  (K)                              CHLORIDE  (CL)
RON (FE)                               SULFATE (SO4)
ESE (MN)                               NITRATE (NO3)
NUM (AL)                              FLUORIDE   (F)
A (SIO2)                             PHOSPHATE (PO4)
                           ------                                       ------
      TOTAL CATIONS        0.0                       TOTAL ANIONS       0.000
    STANDARD DEVIATION OF CATION-ANION BALANCE  0.00 SIGMA

        LABORATORY PH              CARBONATE HARDNESS AS CACO3       0
     FIELD TEMPERATURE      1.8 S NON-CARB. HARDNESS AS CACO3       0
ATED DISSOLVED SOLIDS               TOTAL HARDNESS AS CACO3       0
RATED SOLIDS AT 105 C            TOTAL ALKALINITY AS CACO3       0
ECIFIC CONDUCTANCE IN            LANGLIER SATURATION INDEX
  MICROMHOS/CM AT 25 C               RYSNAR STABILITY INDEX
DIUM ADSORPTION RATIO       0.0       TECH. CORROSION INDEX

                       ADDITIONAL PARAMETERS
ITY,FIELD(JTU)  3729.                     TR IRON (FE)   160.
R COPPER (CU)       .75                   TR ZINC (ZN)   330.
ANGANESE (MN)   480.                  TR CADMIUM (CD)       .32
 ARSENIC (AS)       .03



 PARAMETERS ARE TOTAL DISSOLVED UNLESS LABELED TR-TOTAL RECOVERABLE
LUTE SPECIFIC CONDUCTANCE                      PERCENT REACTANCE VALUES
DSC       0.   CALC DSC      0.    CA  MG  NA  K   CL  SO4 HCO3 CO3 NO3
ERROR DSC   0.0                     0   0   0  0   45   45   5    5   0
ST  KK             COMPUTER RUN   07/23/74PROCESSING PROGRAM 72(REV3)
. IN CORRESPONDENCE RELATED TO THIS ANALYSIS REFER TO NUMBER  74 1905
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TATE HEALTH DEPT. WATER QUALITY BUREAU HELENA, MONTANA 59601

STATE	MONTANA	COUNTY	JEFFERSON
LAT.-LONG.	462128N 112 633W	SAMPLE LOCATION	7N 4W 16
TATION CODE		ANALYSIS NUMBER	79W2297
DATE SAMPLED	09-14-79	DRAINAGE BASIN	041I -U MISSOURI
TIME SAMPLED		WATER FLOW RATE	5. GPM(E)
ETHOD SAMPLED	GRAB	FLOW MEASUREMENT METHOD	FLOAT + TIME
SAMPLE SOURCE	MINE DRAIN	ALTITUDE OF LAND SURFACE	
WATER USE	STOCK	TOTAL WELL DEPTH BELOW LS	
AQUIFER(S)		SWL ABOVE(+) OR BELOW LS	
SAMPLED BY	DSL	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: ALTA MILL Bertha

	MG/L	MEQ/L		MG/L	MEQ/L
CALCIUM (CA)			BICARBONATE(HCO3)		
AGNESIUM (MG)			CARBONATE (CO3)		
SODIUM (NA)			CHLORIDE (CL)		
OTASSIUM (K)			SULFATE (SO4)		
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		
SUM CATIONS	0.0	0.0	SUM ANIONS	0.0	0.000

LABORATORY PH		TOT HARDNESS(MG/L-CACO3)	
IELD WATER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	
M-DISS. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	
AB CONDUCTIVITY-UMHOS-25C		SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS

COPPER,TR (MG/L AS CU)	.15	LEAD,TR (MG/L AS PB)	.07
ZINC,TR (MG/L AS ZN)	2.92	MERCURY, TR (MG/L AS HG)	< .0002
IRON,TR (MG/L AS FE)	2.32	MANGANESE,TR(MG/L AS MN)	5.50
PH,FIELD(SU)	5.0	ANTIMONY (TR mg/l as Sb)	< 0.2
TIN, TR (MG/L AS SN)	< 0.8		

EMARKS: AML

XPLANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
LL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

AMPLE NO AML 05 SAMPLER BAM HANDLING 11 ANALYST DB LAB WQBH
OMPLETED 11-07-79 COMPUTER RUN 11/26/79 DATA 0975/PROG 0876 FUND 6150

	CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
D DEV. ION BALANCE 0.00									
EGMENT MPDES	0.0	0.0	0.0	0.0	33.3	33.3	0.0	33.3	0.0

ALC. MEQ/L= INSUFFICIENT DATA 79W2297

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E HEALTH DEPT.          WATER QUALITY BUREAU          HELENA, MONTANA  59601

      STATE   MONTANA                                        COUNTY  JEFFERSON             1
  LAT.-LONG.  462248N 112 429W                      SAMPLE LOCATION   7N  4W  2CCD
ATION CODE                                          ANALYSIS NUMBER  80W0510
TE SAMPLED   04-16-80                                DRAINAGE BASIN  0411 -U MISSOURI
IME SAMPLED   1430                                  WATER FLOW RATE       .15CFS(M)
HOD SAMPLED   GRAB                         FLOW MEASUREMENT METHOD   FLOW METER
MPLE SOURCE   STREAM                      ALTITUDE OF LAND SURFACE
  WATER USE   UNUSED                     TOTAL WELL DEPTH BELOW LS
 AQUIFER(S)                               SWL ABOVE(+) OR BELOW LS
 SAMPLED BY   WQBH                      SAMPLE DEPTH BELOW SURFACE

      SAMPLING SITE: ALTA MINE DRAINAGE

                  MG/L       MEQ/L                                 MG/L       MEQ/L
ALCIUM (CA)      228.0      11.377   BICARBONATE(HCO3)
NESIUM (MG)       72.7       5.981     CARBONATE (CO3)
SODIUM (NA)                             CHLORIDE  (CL)
ASSIUM  (K)                              SULFATE (SO4)  2550.0        53.091
                                        FLUORIDE    (F)
                                    PHOSPHATE(PO4 AS P)
                                     NO3+NO2 (TOT AS N)
DROGEN (H+)        3.75      3.715
                  ------    ------                         ------      ------
 SUM CATIONS      304.4     21.073               SUM ANIONS  2550.0      53.091

            LABORATORY PH       2.43     TOT HARDNESS(MG/L-CACO3)   868
LD WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
M-DISS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (NTU)   335.
B CONDUCTIVITY-UMHOS-25C  4280.0         SODIUM ADSORPTION RATIO

               A D D I T I O N A L   P A R A M E T E R S
EDIMENT,TOT.SUSP (MG/L)   165.        COPPER,TR (MG/L AS CU)     6.70
   ZINC,TR (MG/L AS ZN)   226.0          IRON,TR (MG/L AS FE)   174.
NGANESE,TR(MG/L AS MN)    307.                   PH,FIELD(SU)     3.5
NC, DISS(MG/L AS ZN)      226.      COPPER, DISS(MG/L AS CU)     6.70
ON,FERROUS,DISS (MG/L)    170.      MANGANESE,DISS(MG/L-MN)    307.

MARKS:  SPRING CREEK SURVEY       NO T.TAKEN

PLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
MPLE NO 11        SAMPLER  GLI    HANDLING 4210    ANALYST   CW    LAB  WQBH
MPLETED 10-14-80  COMPUTER RUN 10/16/80  DATA 0973/PROG 0275 FUND 6053
ND DEV. ION BALANCE  9.99       CA    MG    NA     K    CL   SO4  HCO3   CO3   NO3
GMENT        MPDES             65.5 34.5  0.0   0.0   0.0100.0   0.0   0.0   0.0
LC. MEQ/L= INSUFFICIENT DATA                                              80W0510
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HEALTH DEPT.         WATER QUALITY BUREAU          HELENA, MONTANA  59601
                                                         COUNTY  JEFFERSON
  STATE  MONTANA                                SAMPLE LOCATION   7N  4W   1CCC
 -LONG.  462248N 112 325W                       ANALYSIS NUMBER  81W0861
ION CODE                                         DRAINAGE BASIN   41I
 SAMPLED  05-22-81                                WATER FLOW RATE
 SAMPLED                                   FLOW MEASUREMENT METHOD
 SAMPLED  GRAB                            ALTITUDE OF LAND SURFACE
 SOURCE   STREAM                         TOTAL WELL DEPTH BELOW LS
WATER USE MULTIPLE                         SWL ABOVE(+) OR BELOW LS
QUIFER(S)                                SAMPLE DEPTH BELOW SURFACE
AMPLED BY DFWP

  SAMPLING SITE: CORBIN CREEK AT ITS MOUTH

              MG/L      MEQ/L                              MG/L      MEQ/L
CIUM (CA)    148.0      7.385   BICARBONATE(HCO3)
SIUM (MG)     37.9      3.118     CARBONATE (CO3)
DIUM (NA)                          CHLORIDE   (CL)
SSIUM  (K)                          SULFATE (SO4)    149.0        3.102
                                   FLUORIDE    (F)
                               PHOSPHATE(PO4 AS P)
                                NO3+NO2 (TOT AS N)
              ______    _______                          _______     _______
SUM CATIONS   185.9     10.503          SUM ANIONS       149.0        3.102

        LABORATORY PH       3.75     TOT HARDNESS(MG/L-CACO3)    526
D WATER TEMPERATURE (C)            TOT ALKALINITY(MG/L-CACO3)
DISS. IONS MEAS.(MG/L)             LABORATORY TURBIDITY (NTU)
CONDUCTIVITY-UMHOS-25C  1297.0        SODIUM ADSORPTION RATIO

             A D D I T I O N A L   P A R A M E T E R S
IUM, TR (MG/L AS CD)       .35     COPPER,TR (MG/L AS CU)     12.
ZINC,TR (MG/L AS ZN)     51.          IRON,TR (MG/L AS FE)     52.
MIUM,DISS(MG/L AS CD)      .27    IRON,FERROUS,DISS (MG/L)       .34
PER, DISS(MG/L AS CU)      6.     ZINC, DISS(MG/L AS ZN)     44.




RKS: DFW&P FLOOD SAMPLING

LANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PLE NO          SAMPLER  KH     HANDLING 3210   ANALYST  DME   LAB  WQBH
PLETED 06-09-81  COMPUTER RUN 06/16/81  DATA 0975/PROG 0876 FUND 6053
D DEV. ICN BALANCE -9.99      CA    MG    NA     K    CL   SO4  HCO3  CO3  NO3
MENT      MPDES              70.3 29.7  0.0   0.0  0.0100.0  0.0   0.0  0.0
C. MEQ/L= INSUFFICIENT DATA                                          81W0861
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Miscellaneous Creeks (C-Z) Into File for Corbin Creek

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STATE HEALTH DEPT.        WATER QUALITY BUREAU        HELENA, MONTANA  59601

        STATE  MONTANA                                 COUNTY  JEFFERSON
    LAT.-LONG.  462248N 112 438W             SAMPLE LOCATION    7N  4W  2CCC
  STATION CODE                               ANALYSIS NUMBER  81W0864
  DATE SAMPLED  05-22-81                      DRAINAGE BASIN   41I
  TIME SAMPLED                               WATER FLOW RATE
METHOD SAMPLED  GRAB                FLOW MEASUREMENT METHOD
 SAMPLE SOURCE  STREAM             ALTITUDE OF LAND SURFACE
     WATER USE  MULTIPLE          TOTAL WELL DEPTH BELOW LS
    AQUIFER(S)                     SWL ABOVE(+) OR BELOW LS
    SAMPLED BY  DFWP              SAMPLE DEPTH BELOW SURFACE

      SAMPLING SITE: CORBIN CR JUST ABOVE ALTA MINE DRAINAGE

                   MG/L      MEQ/L                               MG/L       MEQ/L
  LCIUM (CA)       69.8       3.483   BICARBONATE(HCO3)          38.4       0.630
  SIUM  (MG)       18.4       1.514     CARBONATE (CO3)           0.0       0.0
  ODIUM (NA)                             CHLORIDE   (CL)
  SSIUM  (K)                              SULFATE (SO4)         208.0       4.331
                                         FLUORIDE    (F)
                                     PHOSPHATE(PO4 AS P)
                                      NO3+NO2 (TOT AS N)
                  ------     ------                             ------      ------
  SUM CATIONS      88.2       4.997          SUM ANIONS         246.4       4.960

              LABORATORY PH       6.81     TOT HARDNESS(MG/L-CACO3)    250
  WATER TEMPERATURE (C)                  TOT ALKALINITY(MG/L-CACO3)    32
  DISS. IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (NTU)
  CONDUCTIVITY-UMHOS-25C     488.0          SODIUM ADSORPTION RATIO

                 ADDITIONAL  PARAMETERS
CADMIUM,TR (MG/L AS CD)       .05       COPPER,TR (MG/L AS CU)      59.
   ZINC,TR (MG/L AS ZN)      4.           IRON,TR (MG/L AS FE)      12.
CADMIUM,DISS(MG/L AS CD)      .005     IRON,FERROUS,DISS (MG/L)        .01
COPPER, DISS(MG/L AS CU)      .03      ZINC, DISS(MG/L AS ZN)          .47




REMARKS: DFW&P FLOOD SAMPLING

EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
(M)=MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO          SAMPLER  KH     HANDLING 3210    ANALYST  DME    LAB  WQBH
COMPLETED 06-09-81  COMPUTER RUN 06/16/81  DATA 0975/PROG 0876 FUND 6053
STND DEV. ICN BALANCE -0.22      CA    MG    NA     K    CL   SO4  HCO3  CO3  NO3
SEGMENT       NPDES            69.7  30.3  0.0   0.0   0.0  87.3  12.7  0.0  0.0
CALC. MEQ/L= INSUFFICIENT DATA                                              81W0864
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                 WATER QUALITY BUREAU          HELENA, MONTANA  59601

                                             COUNTY  JEFFERSON
   ONTANA                             SAMPLE LOCATION  7N   4W   1CCB
   2255N 112 325W                     ANALYSIS NUMBER  80W0508
                                       DRAINAGE BASIN  0411 -U MISSOURI
   -80                                WATER FLOW RATE        .3 CFS(M)
   400                         FLOW MEASUREMENT METHOD  FLOW METER
   GRAB                         ALTITUDE OF LAND SURFACE
   STREAM                      TOTAL WELL DEPTH BELOW LS
   UNUSED                       SWL ABOVE(+) OR BELOW LS
                               SAMPLE DEPTH BELOW SURFACE
   WQBH
   ING SITE: CORBIN CREEK AT MOUTH
                                                          MG/L        MEQ/L
              MG/L        MEQ/L
   (CA)      118.0        5.888    BICARBONATE(HCO3)
             38.4         3.159      CARBONATE (CO3)
                                      CHLORIDE  (CL)
                                       SULFATE (SO4)    829.0        17.260
                                      FLUORIDE    (F)
                                 PHOSPHATE(PO4 AS P)
                                  NO3+NO2 (TOT AS N)
              0.78        0.776
                                                        ______       ______
   ATIONS    157.2        9.823         SUM ANIONS      829.0        17.260

         LABORATORY PH      3.11    TOT HARDNESS(MG/L-CACO3)    452
   ATER TEMPERATURE (C)           TOT ALKALINITY(MG/L-CACO3)
   IONS MEAS.(MG/L)               LABORATORY TURBIDITY (NTU)    280.
   CTIVITY-UMHOS-25C  1671.0        SODIUM ADSORPTION RATIO

            A D D I T I O N A L   P A R A M E T E R S
   NT.TOT.SUSP (MG/L)   291.         COPPER.TR (MG/L AS CU)      3.40
   INC.TR (MG/L AS ZN)   61.0          IRON.TR (MG/L AS FE)      47.90
   ESE.TR(MG/L AS MN)    76.20                PH.FIELD(SU)       7.0
   DISS(MG/L AS ZN)      61.0      COPPER. DISS(MG/L AS CU)      3.00
   FERROUS.DISS (MG/L)    6.49     MANGANESE.DISS(MG/L-MN)       76.20




   KS:  SPRING CREEK SURVEY       NO T.TAKEN

   ANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
   CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
   MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
   LE NO 09       SAMPLER  GLI    HANDLING 4210   ANALYST   CW    LAB  WQBH
   LETED 10-14-80  COMPUTER RUN 10/16/80  DATA 0975/PROG 0876 FUND 6053
   DEV. ION BALANCE  9.99      CA    MG    NA     K    CL   SO4  HCO3  CO3  NO3
   ENT      MPDES             65.1 34.9   0.0   0.0  0.0100.0   0.0   0.0  0.0
                                                                      80W0508
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WATER QUALITY BUREAU HELENA, MONTANA 59601

	MONTANA	COUNTY	JEFFERSON
	462248N 112 420W	SAMPLE LOCATION	7N 4W 2CDC
		ANALYSIS NUMBER	80W0509
	16-80	DRAINAGE BASIN	041I -U MISSOURI
	1415	WATER FLOW RATE	.3 CFS(M)
	GRAB	FLOW MEASUREMENT METHOD	FLOW METER
	STREAM	ALTITUDE OF LAND SURFACE	
	UNUSED	TOTAL WELL DEPTH BELOW LS	
		SWL ABOVE(+) OR BELOW LS	
	WQBH	SAMPLE DEPTH BELOW SURFACE	

PLING SITE: CORBIN CREEK BELOW ALTA MINE DRAINAGE

	MG/L	MEQ/L		MG/L	MEQ/L
(CA)	147.0	7.335	BICARBONATE(HCO3)		
(MG)	47.3	3.891	CARBONATE (CO3)		
(NA)			CHLORIDE (CL)		
(K)			SULFATE (SO4)	1306.0	27.191
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		
(H+)	2.06	2.042			
CATIONS	196.4	13.268	SUM ANIONS	1306.0	27.191

LABORATORY PH	2.69	TOT HARDNESS(MG/L-CACO3)	561
ATER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	
IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	440.
NDUCTIVITY-UMHOS-25C	2620.0	SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS

ENT.TOT.SUSP (MG/L)	662.	COPPER.TR (MG/L AS CU)	5.07
INC.TR (MG/L AS ZN)	106.	IRON.TR (MG/L AS FE)	101.0
NESE.TR(MG/L AS MN)	148.	PH.FIELD(SU)	3.6
DISS(MG/L AS ZN)	108.	COPPER. DISS(MG/L AS CU)	4.49
FERROUS.DISS (MG/L)	41.6	MANGANESE.DISS(MG/L-MN)	146.

KS: SPRING CREEK SURVEY NO T.TAKEN

ANATION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

LE NO 10 SAMPLER GLI HANDLING 4210 ANALYST CW LAB WQBH
LETED 10-14-80 COMPUTER RUN 10/16/80 DATA 0975/PROG 0876 FUND 6053

			CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
DEV. ION BALANCE	9.99										
ENT	MPDES		65.3	34.7	0.0	0.0	0.0	100.0	0.0	0.0	0.0

INSUFFICIENT DATA 80W0509

rthern
gine..ing
nd Testing, Inc.

600 SOUTH 25TH STREET
P. O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161

TECHNICAL REPORT

Date: June 25, 1984
Job Number: 84-927
Sheet: 1 of 3
Invoice No.: 12701
Work Order No. 0477

Report to:

STATE OF MONTANA
DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION
ATTN: MR. BEN MUNDIE
1625 ELEVENTH AVENUE, HELENA, MT 59620

Report of: Water Analysis - Alta Mine Site

Sample Identification:

On May 10, 1984, these water samples were delivered to our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." The results of the analysis appear on the following pages. A minus sign indicates less than the reported value was present in the sample.

Reviewed by ____________________

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rmr

DEPARTMENT OF STATE LANDS
Helena, MT
Groundwater Analysis - Alta Mine Site

June 25, 1984
Job No. 84-927
Sheet 3 of 3

LAB NO.: 73063 IDENTIFICATION: Alta Stream DATE SAMPLED: 5/09/84

pH, standard units	2.4
Conductivity, umhos/cm	4200
Total Dissolved Solids (180°C, mg/l)	4540

CATIONS	mg/l
Total Hardness as $CaCO_3$	1520
Calcium	394
Magnesium	131
Sodium	576
Potassium	-1

ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	1680
Chloride	1
Fluoride	1.95
Nitrate + Nitrite as N	0.27
Sulfate	3070

TRACE ELEMENTS, mg/l	Dissolved
Aluminum as Al	73.4
Arsenic as As	0.072
Boron as B	0.2
Cadmium as Cd	0.691
Chromium as Cr	0.05
Copper as Cu	7.93
Lead as Pb	-0.02
Molybdenum as Mo	0.12
Nickel as Ni	0.18
Silver as Ag	-0.02
Zinc as Zn	317
Silica as Si	12.3
Titanium as TI	0.02
Lithium as Li	-0.10
Strontium as Sr	0.86

A minus sign indicates less than the reported value was present in the sample.

DEPARTMENT OF STATE LANDS
Helena, MT
Groundwater Analysis - Alta Mine Site

June 25, 1984
Job No. 84-927
Sheet 2 of 3

LAB NO.: 73062 IDENTIFICATION: Alta Shaft Sample DATE SAMPLED: 5/09/84

pH, standard units	2.7
Conductivity, umhos/cm	1590
Total Dissolved Solids (180°C, mg/l)	1390

CATIONS	mg/l
Total Hardness as $CaCO_3$	420
Calcium	122
Magnesium	28
Sodium	128
Potassium	1

ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	451
Chloride	6
Fluoride	0.42
Nitrate + Nitrite as N	0.58
Sulfate	747

TRACE ELEMENTS, mg/l	Dissolved
Aluminum as Al	24.9
Arsenic as As	0.067
Boron as B	-0.1
Cadmium as Cd	0.364
Chromium as Cr	0.04
Copper as Cu	1.57
Lead as Pb	0.26
Molybdenum as Mo	-0.05
Nickel as Ni	0.08
Silver as Ag	-0.02
Zinc as Zn	89.5
Silica as Si	5.9
Titanium as TI	-0.02
Lithium as Li	-0.10
Strontium as Sr	0.50

A minus sign indicates less than the reported value was present in the sample.

Northern
Engineering and Testing, Inc.

600 SOUTH 25TH STREET
P. O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161

TECHNICAL REPORT

AMERICAN COUNCIL OF INDEPENDENT LABORATORIES

Report to:

STATE OF MONTANA
DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION
ATTN: MR. BEN MUNDIE
1625 ELEVENTH AVENUE, HELENA, MT 59620

Date: June 25, 1984
Job Number: 84-927
Sheet: 1 of 3
Invoice No.: 12701
Work Order No. 0477

Report of: Water Analysis - Alta Mine Site

Sample Identification:

On May 10, 1984, these water samples were delivered to our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." The results of the analysis appear on the following pages. A minus sign indicates less than the reported value was present in the sample.

Reviewed by Kathleen A Hunt

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF OUR CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL. SAMPLES WILL BE DISPOSED OF AFTER TESTING IS COMPLETED UNLESS OTHER ARRANGEMENTS ARE AGREED TO IN WRITING.

rmr

DEPARTMENT OF STATE LANDS
Helena, MT
Groundwater Analysis - Alta Mine Site

June 25, 1984
Job No. 84-927
Sheet 3 of 3

LAB NO.: 73063 IDENTIFICATION: Alta Stream DATE SAMPLED: 5/09/84

pH, standard units	2.4
Conductivity, umhos/cm	4200
Total Dissolved Solids (180^{o}C, mg/l)	4540

CATIONS	mg/l
Total Hardness as $CaCO_3$	1520
Calcium	394
Magnesium	131
Sodium	576
Potassium	-1

ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	1680
Chloride	1
Fluoride	1.95
Nitrate + Nitrite as N	0.27
Sulfate	3070

TRACE ELEMENTS, mg/l	Dissolved
Aluminum as Al	73.4
Arsenic as As	0.072
Boron as B	0.2
Cadmium as Cd	0.691
Chromium as Cr	0.05
Copper as Cu	7.93
Lead as Pb	-0.02
Molybdenum as Mo	0.12
Nickel as Ni	0.18
Silver as Ag	-0.02
Zinc as Zn	317
Silica as Si	12.3
Titanium as TI	0.02
Lithium as Li	-0.10
Strontium as Sr	0.86

A minus sign indicates less than the reported value was present in the sample.

DEPARTMENT OF STATE LANDS
Helena, MT
Groundwater Analysis - Alta Mine Site

June 25, 1984
Job No. 84-927
Sheet 2 of 3

LAB NO.: 73062 IDENTIFICATION: Alta Shaft Sample DATE SAMPLED: 5/09/84

pH, standard units	2.7
Conductivity, umhos/cm	1590
Total Dissolved Solids (180°C, mg/l)	1390

CATIONS	mg/l
Total Hardness as $CaCO_3$	420
Calcium	122
Magnesium	28
Sodium	128
Potassium	1

ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	451
Chloride	6
Fluoride	0.42
Nitrate + Nitrite as N	0.58
Sulfate	747

TRACE ELEMENTS, mg/l	Dissolved
Aluminum as Al	24.9
Arsenic as As	0.067
Boron as B	-0.1
Cadmium as Cd	0.364
Chromium as Cr	0.04
Copper as Cu	1.57
Lead as Pb	0.26
Molybdenum as Mo	-0.05
Nickel as Ni	0.08
Silver as Ag	-0.02
Zinc as Zn	89.5
Silica as Si	5.9
Titanium as TI	-0.02
Lithium as Li	-0.10
Strontium as Sr	0.50

A minus sign indicates less than the reported value was present in the sample.

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 3 of 8

Identification: DS-24
Lab No.: 73273
Date Sampled: 5/23/84

pH, standard units	3.0
Conductivity, umhos/cm	5310
Total Dissolved Solids (180°C, mg/l)	3780

CATIONS	mg/l
Calcium	486
Magnesium	156
Sodium	93
Potassium	8

ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	3140
Chloride	5
Fluoride	2.71
Nitrate + Nitrite as N	0.09
Sulfate	5640

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	94.2
Arsenic	0.018
Boron	0.3
Cadmium	0.685
Chromium	0.05
Copper	0.53
Lead	0.99
Molybdenum	0.28
Nickel	0.34
Silver	-0.02
Zinc	681
Strontium	2.35
Lithium	-0.10
Titanium	0.02
Silica	4.0
Vanadium	-0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 2 of 8

Identification: ADSS-1
Lab No.: 73272
Date Sampled: 5/23/84

pH, standard units	7.1
Conductivity, umhos/cm	466
Total Dissolved Solids (180°C, mg/l)	392
CATIONS	**mg/l**
Calcium	58
Magnesium	10
Sodium	41
Potassium	1
ANIONS	
Total Alkalinity as $CaCO_3$	87
Bicarbonate Alkalinity as HCO_3	106
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	0
Chloride	2
Fluoride	0.32
Nitrate + Nitrite as N	-0.05
Sulfate	132

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	-0.1
Arsenic	0.006
Boron	-0.1
Cadmium	0.006
Chromium	-0.02
Copper	-0.02
Lead	-0.02
Molybdenum	-0.05
Nickel	-0.02
Silver	-0.02
Zinc	0.21
Strontium	1.86
Lithium	-0.10
Titanium	-0.02
Silica	3.7
Vanadium	0.2

Identification: DS-100
Lab No.: 73275
Date Sampled: 5/23/84

pH, standard units	3.1
Conductivity, umhos/cm	5520
Total Dissolved Solids (180°C, mg/l)	4060
CATIONS	mg/l
Calcium	491
Magnesium	165
Sodium	103
Potassium	7
ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	2980
Chloride	3
Fluoride	2.71
Nitrate + Nitrite as N	0.07
Sulfate	5950

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	89.4
Arsenic	0.017
Boron	0.3
Cadmium	0.587
Chromium	0.06
Copper	0.46
Lead	0.88
Molybdenum	0.31
Nickel	0.37
Silver	-0.02
Zinc	685
Strontium	2.28
Lithium	0.25
Titanium	0.03
Silica	3.4
Vanadium	-0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 4 of 8

Identification: DS-50
Lab No.: 73274
Date Sampled: 5/23/84

pH, standard units	3.1
Conductivity, umhos/cm	5410
Total Dissolved Solids (180°C, mg/l)	4590

CATIONS	mg/l
Calcium	489
Magnesium	156
Sodium	93
Potassium	8
ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	3010
Chloride	2
Fluoride	2.96
Nitrate + Nitrite as N	0.07
Sulfate	6080

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	88.2
Arsenic	0.020
Boron	0.3
Cadmium	0.559
Chromium	0.06
Copper	0.38
Lead	0.83
Molybdenum	0.31
Nickel	0.38
Silver	-0.02
Zinc	673
Strontium	2.35
Lithium	-0.10
Titanium	0.02
Silica	3.5
Vanadium	-0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 7 of 8

Identification: AMS-1
Lab No.: 73277
Date Sampled: 5/23/84

pH, standard units	6.0
Conductivity, umhos/cm	132
Total Dissolved Solids (180°C, mg/l)	214

CATIONS	mg/l
Calcium	3
Magnesium	7
Sodium	3
Potassium	1
ANIONS	
Total Alkalinity as $CaCO_3$	12
Bicarbonate Alkalinity as HCO_3	15
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	-1
Chloride	-1
Fluoride	-0.10
Nitrate + Nitrite as N	0.13
Sulfate	45

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	0.6
Arsenic	0.005
Boron	-0.1
Cadmium	0.005
Chromium	-0.02
Copper	-0.02
Lead	0.03
Molybdenum	-0.05
Nickel	-0.02
Silver	-0.02
Zinc	0.45
Strontium	-0.05
Lithium	-0.10
Titanium	-0.02
Silica	5.0
Vanadium	-0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 6 of 8

Identification: DS-178
Lab No.: 73276
Date Sampled: 5/23/84

pH, standard units	3.1
Conductivity, umhos/cm	5410
Total Dissolved Solids (180°C, mg/l)	3770
CATIONS	mg/l
Calcium	494
Magnesium	161
Sodium	101
Potassium	9
ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	2980
Chloride	4
Fluoride	2.59
Nitrate + Nitrite as N	0.07
Sulfate	6410

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	89.9
Arsenic	0.016
Boron	0.3
Cadmium	0.742
Chromium	0.06
Copper	0.68
Lead	1.09
Molybdenum	0.32
Nickel	0.38
Silver	-0.02
Zinc	684
Strontium	2.30
Lithium	-0.10
Titanium	0.04
Silica	3.2
Vanadium	-0.2

Northern
Engineering and Testing, Inc.
600 SOUTH 25TH STREET
P. O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161

TECHNICAL REPORT

AMERICAN COUNCIL OF INDEPENDENT LABORATORIES INC.

Report to:

STATE OF MONTANA
DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION
ATTN: MR. BEN MUNDIE
1625 ELEVENTH AVENUE - HELENA, MT 59620

Date: June 27, 1984
Job Number: 84-927
Sheet: 1 of 8
Invoice No.: 12861
Work Order No. 0513

Report of: Water Analysis - Alta Mine Site

Sample Identification:

On May 24, 1984, these water samples were delivered to our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." The results of the analysis appear on the following pages. A minus sign indicates less than the reported value was present in the sample.

Reviewed by ______________________________

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DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 8 of 8

Identification:	VAS-1
Lab No.:	73278
Date Sampled:	5/23/84

pH, standard units	2.7
Conductivity, umhos/cm	4550
Total Dissolved Solids (180°C, mg/l)	3250
CATIONS	**mg/l**
Calcium	484
Magnesium	105
Sodium	76
Potassium	-1
ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	2280
Chloride	1
Fluoride	2.96
Nitrate + Nitrite as N	0.08
Sulfate	3510

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	61.0
Arsenic	0.019
Boron	0.2
Cadmium	3.21
Chromium	0.06
Copper	6.34
Lead	0.03
Molybdenum	0.20
Nickel	0.27
Silver	-0.02
Zinc	447
Strontium	0.58
Lithium	-0.10
Titanium	0.04
Silica	9.8
Vanadium	-0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 3 of 8

Identification: DS-24
Lab No.: 73273
Date Sampled: 5/23/84

pH, standard units	3.0
Conductivity, umhos/cm	5310
Total Dissolved Solids (180°C, mg/l)	3780

CATIONS	mg/l
Calcium	486
Magnesium	156
Sodium	93
Potassium	8

ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	3140
Chloride	5
Fluoride	2.71
Nitrate + Nitrite as N	0.09
Sulfate	5640

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	94.2
Arsenic	0.018
Boron	0.3
Cadmium	0.685
Chromium	0.05
Copper	0.53
Lead	0.99
Molybdenum	0.28
Nickel	0.34
Silver	-0.02
Zinc	681
Strontium	2.35
Lithium	-0.10
Titanium	0.02
Silica	4.0
Vanadium	-0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 2 of 8

Identification:	ADSS-1
Lab No.:	73272
Date Sampled:	5/23/84

pH, standard units	7.1
Conductivity, umhos/cm	466
Total Dissolved Solids (180^{o}C, mg/l)	392

CATIONS	mg/l
Calcium	58
Magnesium	10
Sodium	41
Potassium	1

ANIONS	
Total Alkalinity as $CaCO_3$	87
Bicarbonate Alkalinity as HCO_3	106
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH^-	0
Acidity as $CaCO_3$	0
Chloride	2
Fluoride	0.32
Nitrate + Nitrite as N	-0.05
Sulfate	132

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	-0.1
Arsenic	0.006
Boron	-0.1
Cadmium	0.006
Chromium	-0.02
Copper	-0.02
Lead	-0.02
Molybdenum	-0.05
Nickel	-0.02
Silver	-0.02
Zinc	0.21
Strontium	1.86
Lithium	-0.10
Titanium	-0.02
Silica	3.7
Vanadium	0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 5 of 8

Identification: DS-100
Lab No.: 73275
Date Sampled: 5/23/84

pH, standard units	3.1
Conductivity, umhos/cm	5520
Total Dissolved Solids (180°C, mg/l)	4060
CATIONS	**mg/l**
Calcium	491
Magnesium	165
Sodium	103
Potassium	7
ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	2980
Chloride	3
Fluoride	2.71
Nitrate + Nitrite as N	0.07
Sulfate	5950

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	89.4
Arsenic	0.017
Boron	0.3
Cadmium	0.587
Chromium	0.06
Copper	0.46
Lead	0.88
Molybdenum	0.31
Nickel	0.37
Silver	-0.02
Zinc	685
Strontium	2.28
Lithium	0.25
Titanium	0.03
Silica	3.4
Vanadium	-0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 4 of 8

Identification: DS-50
Lab No.: 73274
Date Sampled: 5/23/84

pH, standard units	3.1
Conductivity, umhos/cm	5410
Total Dissolved Solids (180°C, mg/l)	4590
CATIONS	mg/l
Calcium	489
Magnesium	156
Sodium	93
Potassium	8
ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	3010
Chloride	2
Fluoride	2.96
Nitrate + Nitrite as N	0.07
Sulfate	6080

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	88.2
Arsenic	0.020
Boron	0.3
Cadmium	0.559
Chromium	0.06
Copper	0.38
Lead	0.83
Molybdenum	0.31
Nickel	0.38
Silver	-0.02
Zinc	673
Strontium	2.35
Lithium	-0.10
Titanium	0.02
Silica	3.5
Vanadium	-0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 7 of 8

Identification: AMS-1
Lab No.: 73277
Date Sampled: 5/23/84

pH, standard units	6.0
Conductivity, umhos/cm	132
Total Dissolved Solids (180°C, mg/l)	214

CATIONS	mg/l
Calcium	3
Magnesium	7
Sodium	3
Potassium	1
ANIONS	
Total Alkalinity as $CaCO_3$	12
Bicarbonate Alkalinity as HCO_3	15
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	-1
Chloride	-1
Fluoride	-0.10
Nitrate + Nitrite as N	0.13
Sulfate	45

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	0.6
Arsenic	0.005
Boron	-0.1
Cadmium	0.005
Chromium	-0.02
Copper	-0.02
Lead	0.03
Molybdenum	-0.05
Nickel	-0.02
Silver	-0.02
Zinc	0.45
Strontium	-0.05
Lithium	-0.10
Titanium	-0.02
Silica	5.0
Vanadium	-0.2

DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

June 27, 1984
Job No. 84-927
Sheet 6 of 8

Identification: DS-178
Lab No.: 73276
Date Sampled: 5/23/84

pH, standard units	3.1
Conductivity, umhos/cm	5410
Total Dissolved Solids (180°C, mg/l)	3770

CATIONS	mg/l
Calcium	494
Magnesium	161
Sodium	101
Potassium	9
ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	2980
Chloride	4
Fluoride	2.59
Nitrate + Nitrite as N	0.07
Sulfate	6410

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	89.9
Arsenic	0.016
Boron	0.3
Cadmium	0.742
Chromium	0.06
Copper	0.68
Lead	1.09
Molybdenum	0.32
Nickel	0.38
Silver	-0.02
Zinc	684
Strontium	2.30
Lithium	-0.10
Titanium	0.04
Silica	3.2
Vanadium	-0.2

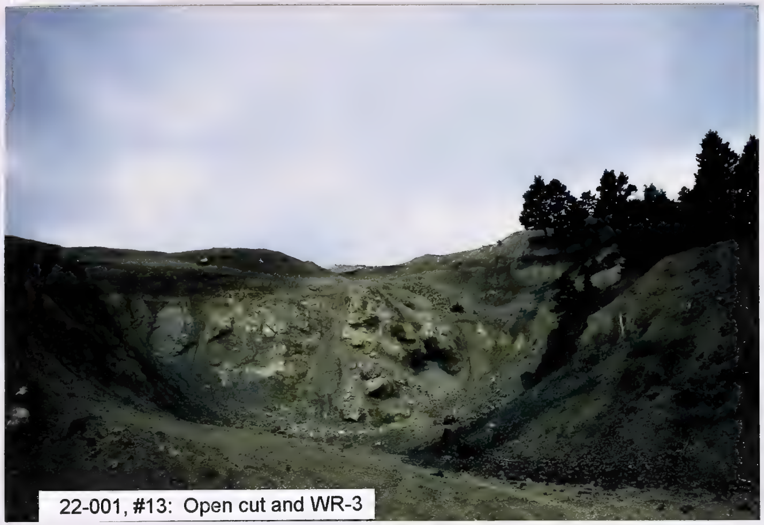
DEPARTMENT OF STATE LANDS
Helena, MT
Water Analysis - Alta Mine

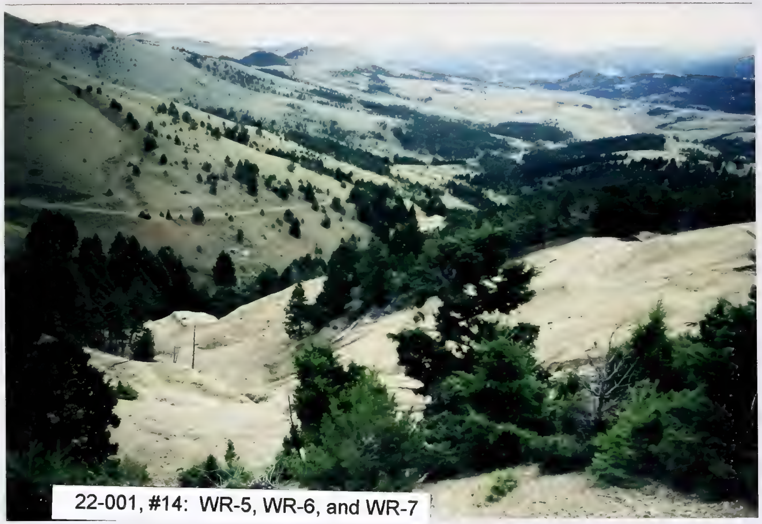
June 27, 1984
Job No. 84-927
Sheet 8 of 8

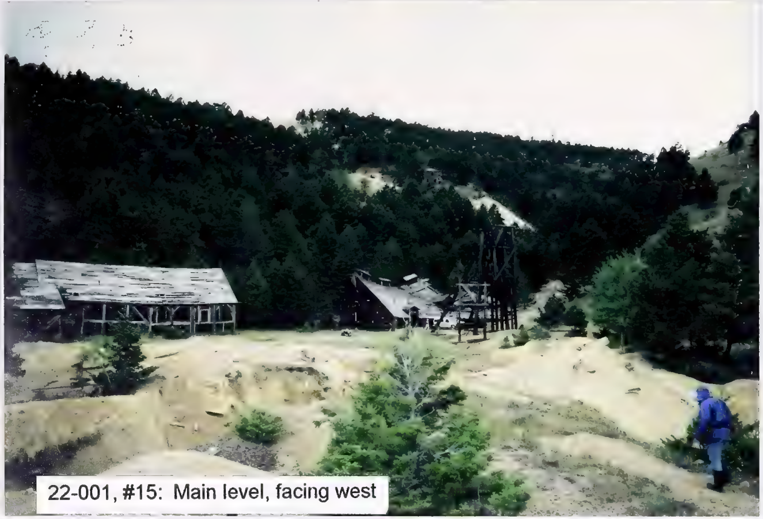
Identification: VAS-1
Lab No.: 73278
Date Sampled: 5/23/84

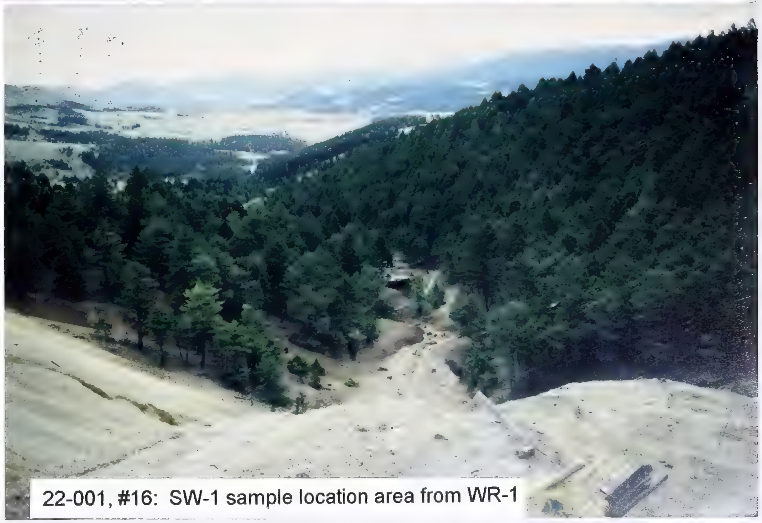
pH, standard units	2.7
Conductivity, umhos/cm	4550
Total Dissolved Solids (180°C, mg/l)	3250
CATIONS	**mg/l**
Calcium	484
Magnesium	105
Sodium	76
Potassium	-1
ANIONS	
Total Alkalinity as $CaCO_3$	0
Bicarbonate Alkalinity as HCO_3	0
Carbonate Alkalinity as CO_3	0
Hydroxide Alkalinity as OH	0
Acidity as $CaCO_3$	2280
Chloride	1
Fluoride	2.96
Nitrate + Nitrite as N	0.08
Sulfate	3510

TRACE ELEMENTS, mg/l	Dissolved
Aluminum	61.0
Arsenic	0.019
Boron	0.2
Cadmium	3.21
Chromium	0.06
Copper	6.34
Lead	0.03
Molybdenum	0.20
Nickel	0.27
Silver	-0.02
Zinc	447
Strontium	0.58
Lithium	-0.10
Titanium	0.04
Silica	9.8
Vanadium	-0.2


22-001, #13: Open cut and WR-3


22-001, #14: WR-5, WR-6, and WR-7


22-001, #15: Main level, facing west


22-001, #16: SW-1 sample location area from WR-1

22-001, #17: WR-1

ALTA
22-001
13

22-001, #18: Adit on main level

ALTA
22-001
14

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: BERTHA **PA#:** 22-002

Date: July 12, 1993 **Time:** 0945-1930

Field Team Leader: Bullock, Pioneer

Sampling Personnel: Flammang, Pioneer
Clark, Pioneer

Visitors: Tuesday, Belanger, Lasher; Pioneer

Weather/Seasonality Observations: Cloudy; cool (55°F); slight breeze; storms passed around the site all day.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1: WR-2, reclaimed area; #2: SW-1 location facing west; #4: TP-3A location facing east; #9: Northern pit; #10: TP-2 looking southeast; #13: WR-1; #14: TP-1. Video Tape No. 4

General Comments/Observations (not covered specifically in attached Inventory Forms): The entire site has been reclaimed. A nearby resident (1/2 mile downgradient), Nancy Roe, said the work was done during the summer of 1987 by MDSL. The shafts have all been covered with concrete or backfilled, as has one adit. Two of the shafts have also been fenced. All structures on the site were buried during the reclamation. Waste rock dumps on the north end of the site have all been recountered, covered with topsoil, and vegetated. Tailings on the south end of the site have been contoured or leveled with waste rock and then covered with topsoil and vegetated. The waste rock dump between tailings ponds 1 and 2 has been contoured (extra rock into the adit), topsoiled, and vegetated.

A ditch has been constructed around the southern end of the western tailings pond and ripraped to control runon. A stream entering the southeastern side of the eastern pond has been ripraped for several hundred feet across the reclaimed area until it meets the ditch. The ditch is then lined with a geotextile liner that is in poor condition. This lined ditch intersects Spring Creek near the east end of the east pond.

Spring Creek has also been lined above this confluence until the creek leaves the reclaimed area.

The upper or western tailings pond has been terraced to reduce slopes. Between terraces, erosion control blankets have been laid down all the way to the creek. The blanket is being displaced at the bottom; the pins holding it down have been torn up. Some vegetation has managed to pioneer, but the bottom 5 feet of the hill near the creek is least vegetated. Runoff ditch controls have been installed between terraces. Vegetation is stressed in areas below the ditches where water ponds develop due to insufficient grade in the ditch bottom.

All reclaimed areas have been fenced to keep the cattle out. In an earlier investigation, a seep was identified under TP-1. A 2" PVC pipe appears to have been installed to control the outflow. During this investigation, the pipe is full of tailings and water is emerging at approx. 1 gpm.

Tailings have washed off the site and down Spring Creek. TP-3 was taken at three different areas of larger deposition further down Spring Creek; however, tailings can be seen for at least 0.3 of a mile downgradient. A community water system was installed by DSL in Corbin in 1987.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Repair and revegetate where necessary. Study water treatment requirements and alternatives.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BERTHA **PA#:** 22-002

Legal Description: T 7N ;R 4W ;Sec. 3 , S 1/4 ___1/4 ___1/4

County: JEFFERSON **Mining District:** COLORADO

Latitude: N 46° 22' 55" **Longitude:** W 112° 05' 10"

Primary Drainage Basin and Code: Little Prickly Pear/10030101
Secondary Drainage Basin: Spring Creek

USGS Quadrangle map name(s): Jefferson city

Mine Type/Commodities: Hardrock/Copper, Lead, Silver, Gold, Zinc

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact (Include address and phone when available): Glenmore Mines, Inc., c/o Richard Peters, 607 North University, Spokane, WA 99206. (509) 924-8093.

Relationship to other mines/sites in the area/district: The Alta mine is nearby. Pegasus is acquiring many of the claims in the area for future expansions for the Montana Tunnels Project.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Reclamation done by MDSL in 1987.

General site features: Elevation 4765'-5180' , **Slope** NE slope 35%
Aspect East for tailings; Southwest for waste rock

Land use: Mining___, Recreational___, Residential___, Urban___, Agricultural X , Other(Specify)___

Area of disturbed/unvegetated lands? 0.13 **acres.**
Dimensions: Entire site has been reclaimed (except WR-1, still unvegetated); small areas are burned or stressed, streamside tailings below the tailings impoundment.

Predominant vegetation types: Douglas fir, Ponderosa pine, rose, rabbitbrush, and current, Red and Idaho Fescue.

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites). Near Corbin Tailings, Wickes Tailings, Gregory Mine, and Alta Mine.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 8 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site lies in the Spring Creek drainage. The area is underlain by quartz monzonite of Boulder Batholith.

Mining/milling history, ore type/tenor, host rock, gangue: Mining began in 1905 and operated continuously until 1918; 90,000 tons of ore with 280 oz Au, 162,500 oz Ag, 1,200 tons of Cu, 13 tons of Pb were produced. The average value was 0.003 oz/ton Au, 1.8 oz/ton Ag, and 1.35% Cu. Ore occurred in a vein in quartz monzonite of Boulder Batholith; ore consisted of coarse white quartz carrying chalcopyrite, pyrite, crushed and altered monzonite with a small amount of Pb and Bi.

Mine Operation?

Shafts - Yes X, No ___, # 4, Comment Reclaimed

Adits - Yes X, No ___, # 1, Comment Backfilled

Pits - Yes ___, No X, # ___, Comment

Placers - Yes ___, No X, # ___, Comment

Other - Yes ___, No X, # ___, Comment

Mill Operation? Yes X, No ___. If yes answer the next three questions:

Period(s) of Operation: 1907 to 1917

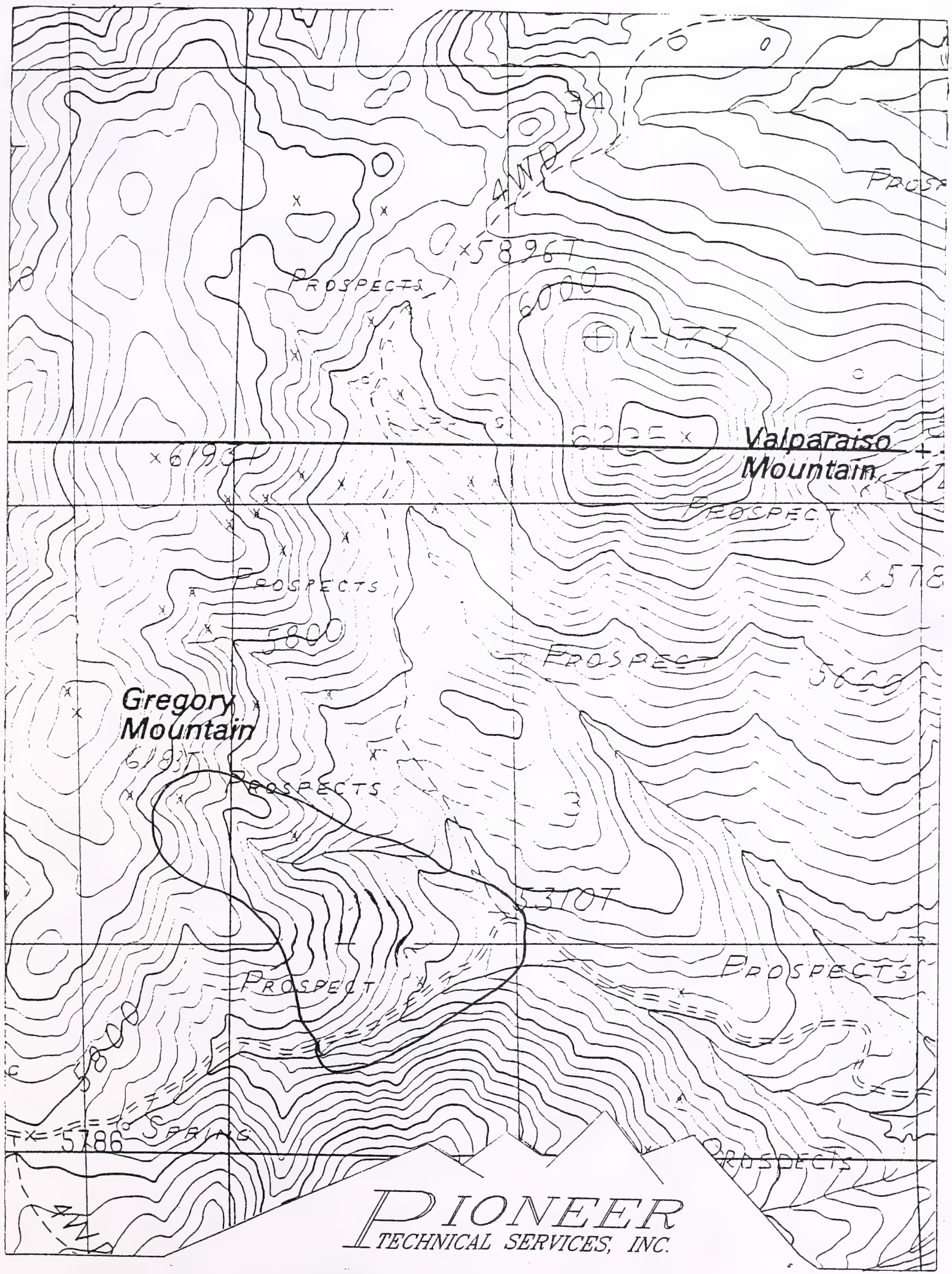
Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: Unknown

Process? Hg-amalgam, CN^- leach (vat, heap), floatation, smelting? Early 1900's gravity concentrator with capacity of 200 tons/day. In 1911, a 100 ton/day floatation plant was built; both burned in 1917.

Montana Bureau of Mines and Geology
Water Well Log Data

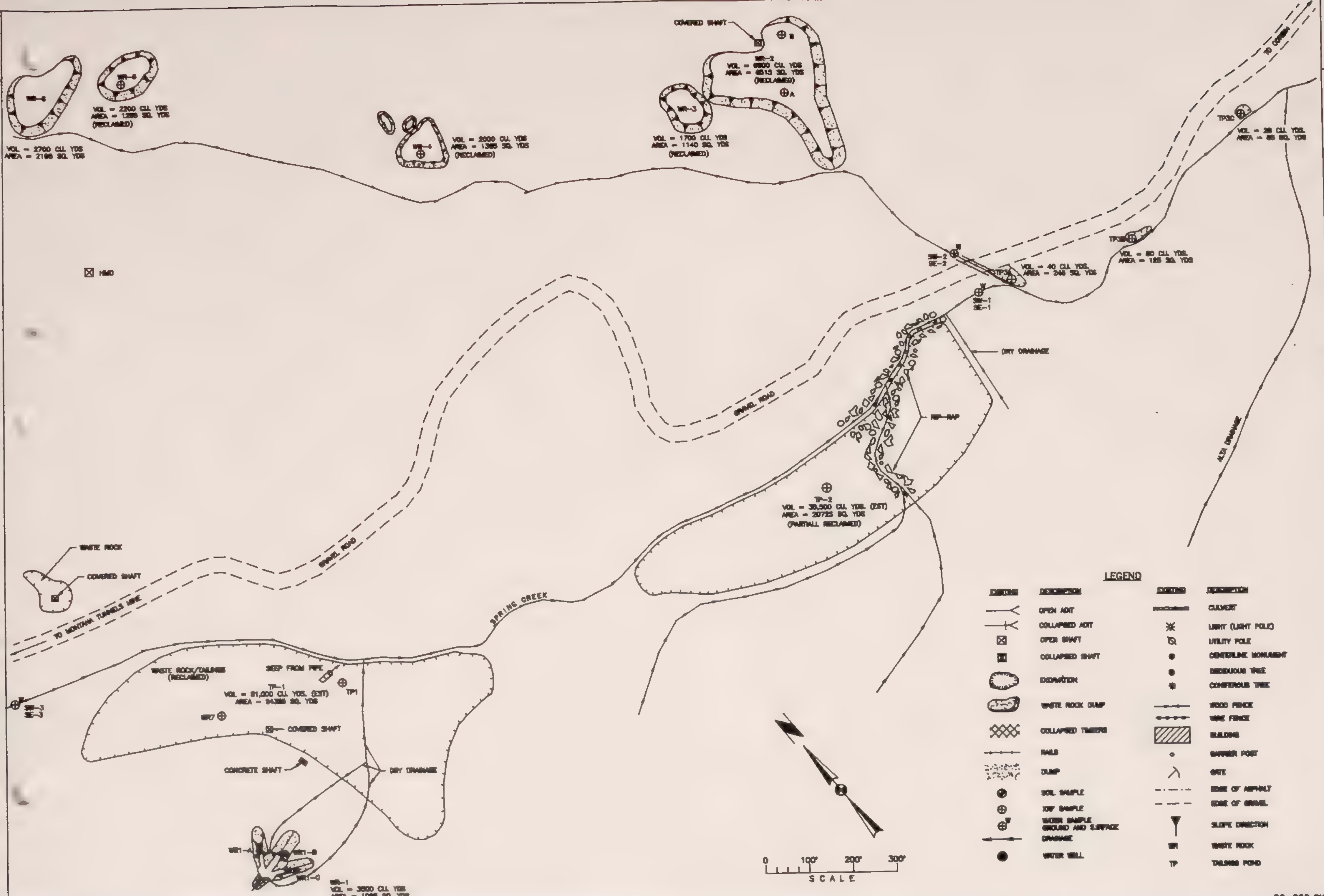
11/01/1993

Well No.	Location	Depth	Yield	Static Water Level
M:55781	07N 04W 02	65.0	1.0	0.00 ①
M:55782	07N 04W 02 B	0.0	100.0	12.00 ②
M:55783	07N 04W 02 BC	152.0	500.0	8.00 ③
M:55784	07N 04W 02 DD	38.0	10.0	15.00 ④
M:55785	07N 04W 03	95.0	8.0	35.00 ⑤
M:55786	07N 04W 03	70.0	30.0	20.00 ⑥
M:55787	07N 04W 03 DCA	95.0	8.0	35.00 ⑦
M:55791	07N 04W 09 BA	300.0	120.0	15.00
M:55792	07N 04W 09 BAA	400.0	50.0	9.00
M:55793	07N 04W 09 BAD	149.0	70.0	45.00
M:55794	07N 04W 11 ACD	23.0	15.0	6.00 ⑧
M:55795	07N 04W 11 CA	54.0	40.0	6.00
M:5432	07N 04W 11 CDCD	84.3	0.0	7.34



PIONEER
TECHNICAL SERVICES, INC.

BERTHA, P.A. NO. 22-002
T07N, R04W, SECTION 03
SCALE: 1" = 1000'



MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

BERTHA PA# 22-002
COLORADO DISTRICT JEFFERSON COUNTY

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

SHEET NO.

22-002.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): Reclaimed tailings appear to be approx. 50% fine sand and 50% silt or clay.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Tailings are reported to be 30 feet at east and thinning to 7 feet at west end. This could not be confirmed during this investigation due to reclamation activities.

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): Dam on western pond (TP-1) appears to have been breached at one time, though now is covered with grass.

Comments on potential for mitigation: Tailings ponds have been reclaimed.

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Flammang, Clark*

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	3,500	Near top of eastern most lobe	None	< 3.5 (D)	0.02	22-002-WR-1	07/12/93 1737	T-Metals, ABA
WR-1B	WR		Near top of center lobe	None	< 3.5 (D)	0.04			
WR-1C	WR		Near top of western most lobe	None	< 3.5 (D)	0.03			
WR-2A	WR	9,800	First dump encountered on North Fork Spring Creek	Topsoil-Veg	5.8 (D)	0.02	20-002-WR-2	07/12/93 1738	T-Metals, ABA
WR-2B	WR		First dump encountered on North Fork Spring Creek	Topsoil-Veg	< 3.5 (D)	0.035			
WR-3	WR	1,700	Northwest of WR-2	Topsoil-Veg	NM	NM	N/A	N/A	N/A
WR-4	WR	2,000	In north pit waste rock area	Topsoil-Veg	6.6 (D)	0.03	N/A	N/A	XRF Analysis
WR-5	WR	2,200	On north side of site, 2nd waste rock area from west edge	Topsoil-Veg	6.75 (D)	0.03	N/A	N/A	XRF Analysis
WR-6	WR	2,700	Northwest of WR-5	Topsoil-Veg	NM	NM	N/A	N/A	N/A
WR-7	WR	NM	Waste rock associated with TP-1	Topsoil-Veg	NM	NM	N/A	N/A	N/A
SS-1	BKGRND	N/A	Background soil, 200' above WR-1	N/A	5.00	NM	22-002-SS-1	7/12/93 1445	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-002-WR-1 is composite of WR-1A through -1C. 22-002-WR-2 is composite of WR-2A and -2B. NM = Not Measured.

*Continued on next page

SOURCE INVENTORY FORM

SAMPLERS: Bullock, Flammang, Clark

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1	TAIL	81,000	Toe of TP-1 near pipe discharge	Topsoil-Veg	< 3.5 (D)	0.035	N/A	N/A	XRF Analysis
TP-2A	TAIL	35,500	Lower pond, west end; 0.5'-1', orange sand	Topsoil-Veg	5.3 (D)	0.035	22-002-TP-1	07/12/93 1831	T-Metals, ABA
TP-2B	TAIL		Lower pond, west end; 1'-3', gray clay	Topsoil-Veg	< 3.5 (D)	0.04			
TP-3A-A	TAIL	40	Taken in first major streamside deposit just downgradient of TP-2 fence	None	< 3.5 (D)	0.03	22-002-TP-2	07/12/93 1823	T-Metals, ABA
TP-3A-B	TAIL		Taken in first major streamside deposit just downgradient of TP-2 fence	None	4.2 (D)	0.03			
TP-3B-A	TAIL	80	200 feet from TP-3A in second major deposition area	None	< 3.5 (D)	0.025			
TP-3B-B	TAIL		200 feet from TP-3A in second major deposition area	None	< 3.5 (D)	0.03			
TP-3B-C	TAIL		200 feet down from TP-3A in second major deposition area	None	< 3.5 (D)	0.04			
TP-3B-D	TAIL		200 feet down from TP-3A in second major deposition area	None	< 3.5 (D)	0.03			
TP-3C-A	TAIL	28	288 feet from edge of TP-3B in third major deposition area	None	< 3.5 (D)	0.035			
TP-3C-B	TAIL		288 feet from edge of TP-3B in third major deposition area	None	< 3.5 (D)	0.045			
TP-3C-C	TAIL		288 feet from edge of TP-3B in third major deposition area	None	3.9 (D)	0.035			

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-002-TP-1 is a composite of TP-2A and -2B. 22-002-TP-2 is a composite of TP-3A-A and -3A-B, TP-3B-A through TP-3B-D, and TP-3C-A through -3C-C.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No_X_, Number:____ Identification:____________

Filled shafts: Yes___, No_X_, Number:____ Identification:____________

Seeps/Springs: Yes_X_, No_____, Number:_1___ Identification:_Pipe discharge_

Groundwater wells within 5 miles?: Yes_X_, No___;
Number of well logs:_95_

Distance to nearest well used for drinking?_Corbin is 1/2 mile away, but put on community water system in 1987._

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable_X_, Possible____, Unlikely____.
Even though runon controls have been installed, water is seeping out at least in one location from below the tailings (TP-1). Water is also ponding on both TP-1 and -2 in small ponds.

Other observations/notes:_N/A_

GROUNDWATER INVENTORY FORM

SAMPLERS: ______

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
No samples were taken.												

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

______

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Spring Creek; unnamed tributary entering tailings near east end; unnamed tributary east past WR-4 and WR-5

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes ___, No X, Name(s)/Description: ___

Waste materials within any floodplain: Yes X, No ___ Source ID(s): TP-1, -2, and -3

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? .094 cfs
High Flow: 3 cfs, Average Flow: 0.3 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet; stream flows along north edge of TP-1 and -2. TP-3 is composed of multiple areas of tailings deposited by the stream down the drainage.

Surface water draining onto or through waste sources: Yes X, No ___, Describe: Several erosion channels are present on the south side of the site, with evidence of carrying water recently. A small unnamed tributary drains through east end of TP-2. It has been ripraped and lined with a liner (which is deteriorating) across the tailings.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?) Prickly Pear Creek-agriculture, possible irrigation, and recreation.

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___, Distance downstream (ft)? 1/2 mi Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present): Tailings are present in the stream drainage to Corbin.

SURFACE WATER INVENTORY FORM

SAMPLERS: Bullock, Flammang, Clark

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Spring Creek immediately downgradient of TP-2	7.79	367	191	16.3	95	42 gpm (M)	22-002-SW-1	07/12/93 1145	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Spring Creek immediately downgradient of TP-2	N/A	N/A	N/A	N/A	N/A	N/A	22-002-SE-1	07/12/93 1145	T-Metals
SW-2	SW	Unnamed tributary to Spring Creek which flows past northern workings, above confluence with Spring Creek	8.15	333	168	13.0	138	28 gpm (M)	22-002-SW-2	07/12/93 1200	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Unnamed tributary to Spring Creek which flows past northern workings, above confluence with Spring Creek	N/A	N/A	N/A	N/A	N/A	N/A	22-002-SE-2	07/12/93 1200	T-Metals
SW-3	SW	Spring Creek upgradient of TP-1	7.56	368	145	12.7	125	20 gpm (M)	22-002-SW-3	07/12/93 1530	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-3	SE	Spring Creek upgradient of TP-1	N/A	N/A	N/A	N/A	N/A	N/A	22-002-SE-3	07/12/93 1530	T-Metals
SE-500	SE	Sediment 500 feet downstream from SW-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis
SE-1000	SE	Sediment 1,000 feet downstream from SW-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	XRF Analysis

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? There is space between TP-2 and Corbin or lower part of TP-2 for treatment.

Wetlands present: Yes___, No_X_, Describe:___

Carbonate rocks/soils: Yes_X_, No___, Describe: Limestone reported as host rock, skarn containing mineralization.

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100_X_; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments___

Nearest residence(ft or miles)? 1/2 mile

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Bullock, Flammang, Clark

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
WR-1	SO3; pH	Dry	9,855	9,855	Yes	Low
WR-2	SO3	Dry	58,635	0	No	None
WR-3	None	Dry	10,260	0	No	None
WR-4	SO3	Dry	12,285	0	No	None
WR-5	None	Dry	11,655	0	No	None
WR-6	None	Dry	19,760	0	No	None
TP-1	Low pH	Partial	218,925	10,945	No	None
TP-2	Low pH	Partial	186,525	93,260	No	None
TP-3A	pH	Partial	2,205	2,205	Yes	Low
TP-3B	pH	Partial	1,125	1,125	Yes	Low
TP-3C	pH	Partial	765	765	Yes	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes_____, No_X__, Describe:____________________

Population within 1 mile: 1-10_X_; 10-30___; 30-100___; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments____________________

Evidence of recreational use on site: Yes___, No_X_, Describe:________

Accessibility - Fences, warning signs, closed roads?_ Entire area is fenced.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment__________
Wilderness Area - Yes___, No_X_, Comment__________
T&E Species Habitat - Yes___, No_X_, Comment__________
Bat Habitat - Yes___, No_X_, Comment__________

Primary Drainage___; Secondary Drainage_X_; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - _3_
Sport Fishery Classification - _Not Rated_

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1__, types and locations:___ At top of ridge between north and south sides of site, shaft is 15'x15'x25' deep and steep sided.

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____, types and locations:__________

Unstable waste piles, impoundments, undercut banks: Yes_X_, No____, Number_1__, types and locations:_ WR-1 slopes are at angle of repose.

Fire and/or Explosion hazards: Yes___, No_X_, Explain:__________

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MBMG, Well Log Database, September 8, 1993.

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LABORATORY ANALYTICAL DATA

BERTHA
PA NO. 22-002

Bertha PA# 22-002
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – TUESDAY
INVESTIGATION DATE: 06/22/93

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-002-SE-1	19 J	37.4	3.9	8.5	7 J	395 J	15100	0.015	740	7 J	223 J	6 UJ	739	NR
22-002-SE-2	78 J	51.6	2.7	8.1	11.3 J	186 J	29800	0.022	412	9 J	168 J	7 UJ	384	NR
22-002-SE-3	33 J	46.7	1.2	10.8	9.9 J	78.1 J	22400	0.014	476	10 J	68 J	6 UJ	121	NR
22-002-TP-1	90 J	34.7	7.6	6.4	1.5 U	6320 J	35400	1.34	1120	9 J	588 J	21 J	1200	NR
22-002-TP-2	44 J	32.7	3	4.1	3.6 J	2270 J	17400	0.209	485	5 J	245 J	8 J	371	NR
22-002-WR-1	420 J	70.9	21.3	3.6	1.1 U	2290 J	45700	2.62	362	2 U	8170 J	25 J	2520	NR
22-002-WR-2	30 J	38.7	4.4	7.7	3.8 J	998 J	27000	0.345	607	10 J	292 J	6 UJ	472	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22-002-TP-1	3.6	112	38.2	-74.	0.23	2.56	0.81	80	-41.7
22-002-TP-2DUP	0.59	18.4	3.86	-14.	0.35	0.05	0.19	1.56	2.3
22-002-TP-2	0.6	18.7	3.89	-14.	0.35	0.09	0.16	2.81	1.08
22-002-WR-1	4.19	131	-10.	-142	1.84	0.91	1.44	28.4	-39.3
22-002-WR-2	2.33	72.8	104	31.6	1.19	0.44	0.7	13.7	90.7

WATER MATRIX ANALYSES

Metals in Water Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22-002-SW-1	9.14 J	19.90	3.27 J	9.70 U	6.83 U	19.80	7220 JX	0.120	158	12.7 U	2.87	30.7 U	62.5 J	178
22-002-SW-2	10.91 J	81.20	25.80 J	9.70 U	6.83 U	1540	3710 JX	0.110	1620	22.5	81.7	30.7 U	2920 J	324
22-002-SW-3	5.58 J	73.30	2.57 U	9.70 U	6.83 U	19.00	2770 JX	0.150	153	12.7 U	15.1	30.7 U	109 J	211

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Wet Chemistry Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
22-002-SW-1	526	< 5.0	253	< 0.05	NR
22-002-SW-2	352	< 5.0	115	< 0.05	NR
22-002-SW-3	340	< 5.0	113	< 0.05	NR

LEGEND

SE1 – Spring Creek immediatly downgradient of tailings pond 2.
SE2 – Unnamed tributary to Spring Creek which flows past Northern workings.
SE3 – Spring Creek upgradient of tailings pond 1.
TP1 – Sample of the TP1A subsample.
TP2 – Composite of subsamples TP3A-A, 3A-B, 3B-A, 3B-B, 3B-C, 3B-D, and 3C-A through 3C-C.
WR1 – Composite of subsamples WR1A, 1B, and 1C.
WR2 – Composite of subsamples WR2A and 2B.

BACKGROUND – From the Bertha Mine (22-002-SS-1).
SW1 – Same as sample SE1.
SW2 – Same as sample SE2.
SW3 – Same as sample SE3.

XRF ANALYSIS RESULTS

BERTHA
PA NO. 22-002

Mine Name: Bertha PA# 22–002
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22–002–SE–1000		14517.2	5227.36	1502.84		743.55 *	26144.6			299.149	95.2661 *	340.955
22–002–SE–500		17858	11807.4	2405.88		1263.33	24357.4		323.832	674.224		370.073
22–002–SS–1		14683.8	9173.42	1986.39		1346.53	32388.7		146.187 *	670.326		285.459
22–002–TP1–A		38876.8	3592.17	1571.69			16551.6		1950.33	261.755		235.072
22–002–TP2–A		50743.5	11741	1306.56		1203.15	28755.1	344.599 *	3881.36	547.577		1175.56
22–002–TP2–B		22185	9330.04	3138.3		524.226 *	49926.8		615.093	388.697		424.171
22–002–TP3A–A		17167.4	7101.81	930.528			15724.9		273.963	61.2006 *		109.436
22–002–TP3A–B		21963.5	11757.7	2607.3		676.737 *	33818.1		269.458	176.381		379.932
22–002–TP3B–A		13563.3	6110.27	755.989		1585.39	7879.3		2650.35	1257.71		75.8409
22–002–TP3B–B		15904.9	1797.23	718.943			17321.4	203.357 *	472.006	102.007 *		106.472
22–002–TP3B–C		46979.9	4900.01	1412.48			23516.3		816.156	279.938		544.053
22–002–TP3B–D		18108.3	7668.79	3055.96		1333.6	38781.8		2117.13	450.885	44.9882 *	313.286
22–002–TP3C–A		15720.8	3903.71	911.834			10949.4		164.357 *	79.1247 *		92.3989
22–002–TP3C–B		11610.2	3295.87	573.13		475.811 *	6114.11		8702.17	292.357		81.7501
22–002–TP3C–C		20367.6	10766.6	2908.52		958.933 *	31420.7		252.867	226.267	34.0103 *	358.063
22–002–TP–2–COMP		22375.3	5544.94	1307.06		491.114 *	18579.1		2009.93	325.366		228.472
22–002–WR1–A		29233.6	1895.94	1391.43		959.033 *	45847.3		1781.36	4274.14		67.7247
22–002–WR1–B		32467.3	6531.71	1335.39		340.794 *	30321.9		2452.77	1243.38		160.058
22–002–WR1–C		31660.7	17746.2	1960.15		981.38 *	58119		1390.84	1862.96		167.064
22–002–WR2–A		21347	30348.1	1692.13		690.009 *	27496.3		215.047	341.359		239.525
22–002–WR2–B		25144.3	17989.1	2377.62		1154.33	38673.9		935.739	762.761		347.707
22–002–WR4–A		23060.1	24885.9	2616.15		1761.74	26410.1			340.848		268.494
22–002–WR5–A		23031.2	4259.52	1813		3614.75	48185.7		198.016 *	586.632	134.064 *	161.997
22–002–WR–1–COMP		36491.1	9749.11	1445.37		756.93 *	51797.2	446.521 *	2546.57	3149.65		136.56
22–002–WR–2–COMP		25176.1	28801	2145.53		898.734 *	35487.8		467.781	429.558		320.833

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22–002–SE–1000	111.077			81.7467	161.833			727.504			12.3634
22–002–SE–500	175.607	37.8416 *		88.88	178.751			739.951			16.3741
22–002–SS–1	210.197			251.942	174.463			476.203			15.3299
22–002–TP1–A	93.8265	47.5771 *	9.74769 *	748.366	350.844			282.956			68.0777
22–002–TP2–A	83.9934	56.2735 *	56.1486	330.774	451.764	200.17 *		269.377			104.616
22–002–TP2–B	232.596	34.7854 *	5.60384 *	322.627	179.056			532.586			32.1217
22–002–TP3A–A	70.5323	31.2842 *	17.1907	387.077	199.105			166.264			94.3606
22–002–TP3A–B	204.644			64.7036 *	160.452			717.431			13.514 *
22–002–TP3B–A	50.0866		6.18448 *	157.329	132.634		44.1524 *	93.9527			39.597
22–002–TP3B–B	65.8508		10.8008 *	220.791	178.51			132.246			54.3001
22–002–TP3B–C	61.2462	73.4264 *	33.6298	523.958	455.662			219.347			130.466
22–002–TP3B–D	165.987			208.122	186.138			475.783		25.9654 *	23.16
22–002–TP3C–A	35.444		4.49148 *	110.599	155.826			116.742			35.4459
22–002–TP3C–B	36.7852	28.1235 *	9.60218 *	130.028	121.297			87.3533			30.9907
22–002–TP3C–C	266.813	30.2896 *		67.0327 *	188.759			627.05			16.458
22–002–TP–2–COMP	77.1314		9.64006 *	221.768	204.761						
22–002–WR1–A	126.854	66.855 *	37.2862	8041.08	281.549			170.442	151.544 *		70.4196
22–002–WR1–B	142.752	32.4187 *	9.06568 *	2075.16	259.094		59.5431 *	216.255	89.4037 *		29.8716
22–002–WR1–C	164.507	60.5235 *	8.99668 *	3413.3	289.998		147.79 *	506.506	161.81 *		52.8588
22–002–WR2–A	114.447		5.78503 *	158.44	180.191			352.039			12.4848
22–002–WR2–B	133.195	41.9835 *		390.837	197.247			447.871			19.7041
22–002–WR4–A	142.262			132.205	191.466			373.457			24.4928
22–002–WR5–A	189.912		6.10043 *	160.166	205.333			391.646		11.9505 *	11.2917
22–002–WR–1–COMP	126.658	58.5721 *	22.0389 *	5908.93	295.355		81.2453 *	237.798	138.758 *		57.8467
22–002–WR–2–COMP	122.914	37.2648 *	5.96645 *	229.638	184.873			447.247			21.2087

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

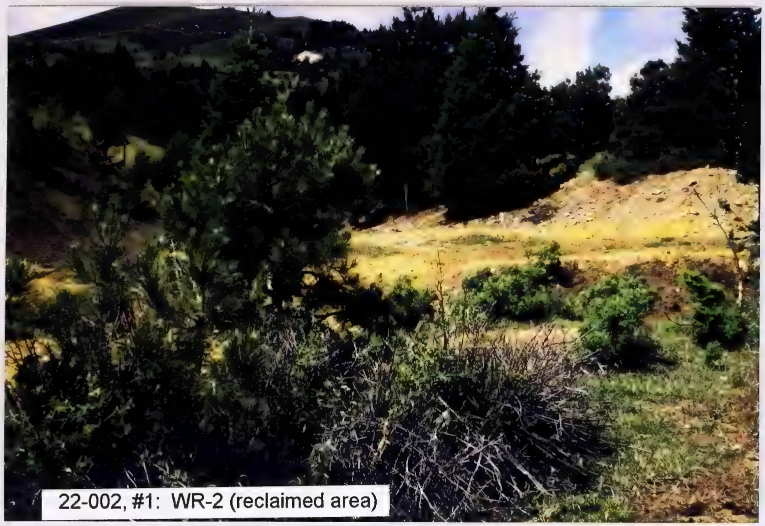
BERTHA
PA NO. 22-002

AIMSS SCORESHEET

SITE NAME: BERTHA
PA NUMBER: 22-002

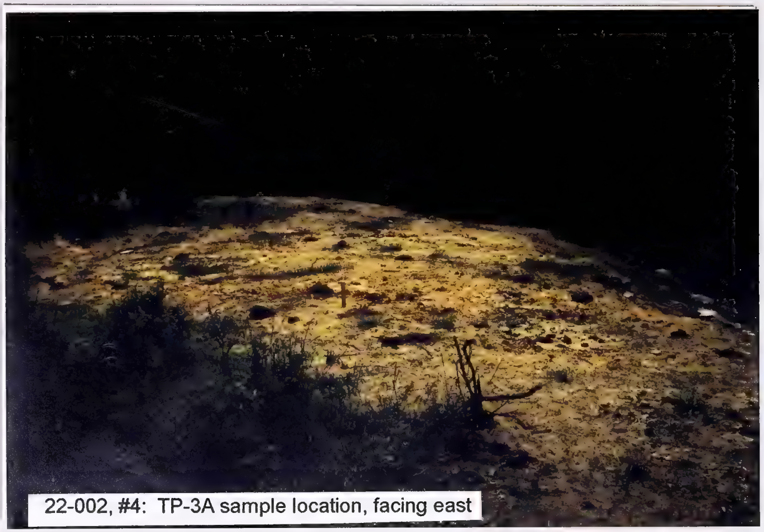
LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	39.875
6	GW - TARGETS	WELLS - 1 MI. x 2.5		20.0
7		WELLS - 1 TO 4 MI		87
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	112.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	1786400
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	50.474
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		3
18		WETLANDS		0
19		FISHERY		5
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	10
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	403792
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	100
27		LIKELIHOOD SCORE	LINES 25 + 26C	100
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.328
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		5
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	45
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	1476
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		1
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	10
38		LIKELIHOOD SCORE	LINES 36 + 37C	10
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.000
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		1
41		NEAREST RESIDENCE		5
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	6
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**21.92**

LINE NO.		SITE SAFETY		SITE NAME: BERTHA PA NUMBER: 22-002
1	THREAT	ACCESSIBILITY		1
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	100
9		POPULATION - 1 MILE		1
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	6
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.60**

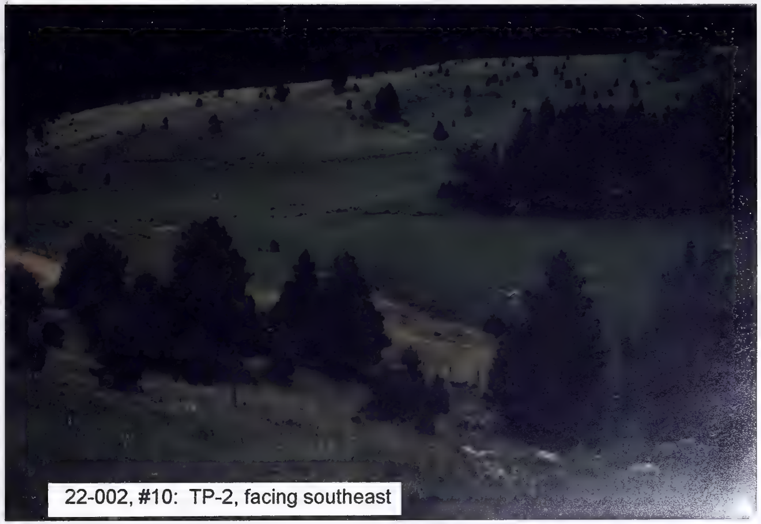


22-002, #1: WR-2 (reclaimed area)

22-002, #2: SW-1 and SE-1 sample location, facing west



22-002, #4: TP-3A sample location, facing east



22-002, #10: TP-2, facing southeast

22-002, #13: WR-1

22-002, #14: TP-1

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: BLUEBIRD **PA#:** 22-003

Date: July 8, 1993 **Time:** 0930

Field Team Leader: Babits, Pioneer

Sampling Personnel: Pierson, TD&H
Lasher, Pioneer

Visitors: None

Weather/Seasonality Observations: Cool; breezy; scattered showers; cool, wet spring.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number)**:** #17: Upper adit and discharge; #18: WR-1; #19: Lower adit and discharge; #20: WR-3. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms)**:** N/A

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Very large waste rock that is not steep and could be revegetated. Adit discharge is low flow with neutral pH, but has elevated As, Cd, and Cu and may need treatment.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): BLUEBIRD PA#: 22-003

Legal Description: T 7N ;R 5W ;Sec. 13 , N 1/2 ALL1/4 1/4

County: JEFFERSON Mining District: COLORADO

Latitude: N 46° 21' 32" Longitude: W 112° 10' 00"

Primary Drainage Basin and Code: Spring Creek/10030101
Secondary Drainage Basin: Curtain Gulch

USGS Quadrangle map name(s): Mount Thompson

Mine Type/Commodities: Hardrock/Gold, Silver

Activity Status: Active___,Inactive/Exploration___,Abandoned X .

Ownership status: Known YX N__; private/public? Private/Public
Owner, Agent, or Contact(Include address and phone when available): Diane Tintinger Thompson, P.O. Box 189, Jefferson City, MT 59638-0189. (406) 933-5640; Helena National Forest.

Relationship to other mines/sites in the area/district: Pen-yan mine is adjacent to this site.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? N/A

General site features: Elevation 7000', Slope 20% to E ,
Aspect Southeast

Land use: Mining___, Recreational___, Residential___, Urban___,
Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? 4 acres.
Dimensions:

Predominant vegetation types: Rough fescue, Idaho fescue, subalpine pine, grouse whortleberry

Access: roads - good___,poor___,4wd X ,trail___.
Other logical considerations (proximity to other sites).

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are no well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Site is underlain by an andesite remnant over the quartz monzonite of the Boulder Batholith. Mineralization occurs as shoots along a granite dike and shale present in the area. The site lies in Wood Chute Gulch; a spring upgradient drains through the site.

Mining/milling history, ore type/tenor, host rock, gangue: Initial discovery of the site was made in 1887 and was mined consistently through 1946. Total production from 1902 to 1946 inclusive is reported as 3,454 oz. Au, 33,393 oz. Ag, 960,259 lbs. Cu, and 203,949 lbs. Pb recovered from 17,989 tons of ore. Average metal content per tone of ore was 0.19 oz. Au, 18.65 oz. Ag, 2.69% Cu, and 0.57% Pb. Gangue is mostly tourmaline and quartz, with tetrahedrite and pyrite; locally, sphalerite, galena, arsenopyrite, and some chalcopyrite as mineralization in the vein.

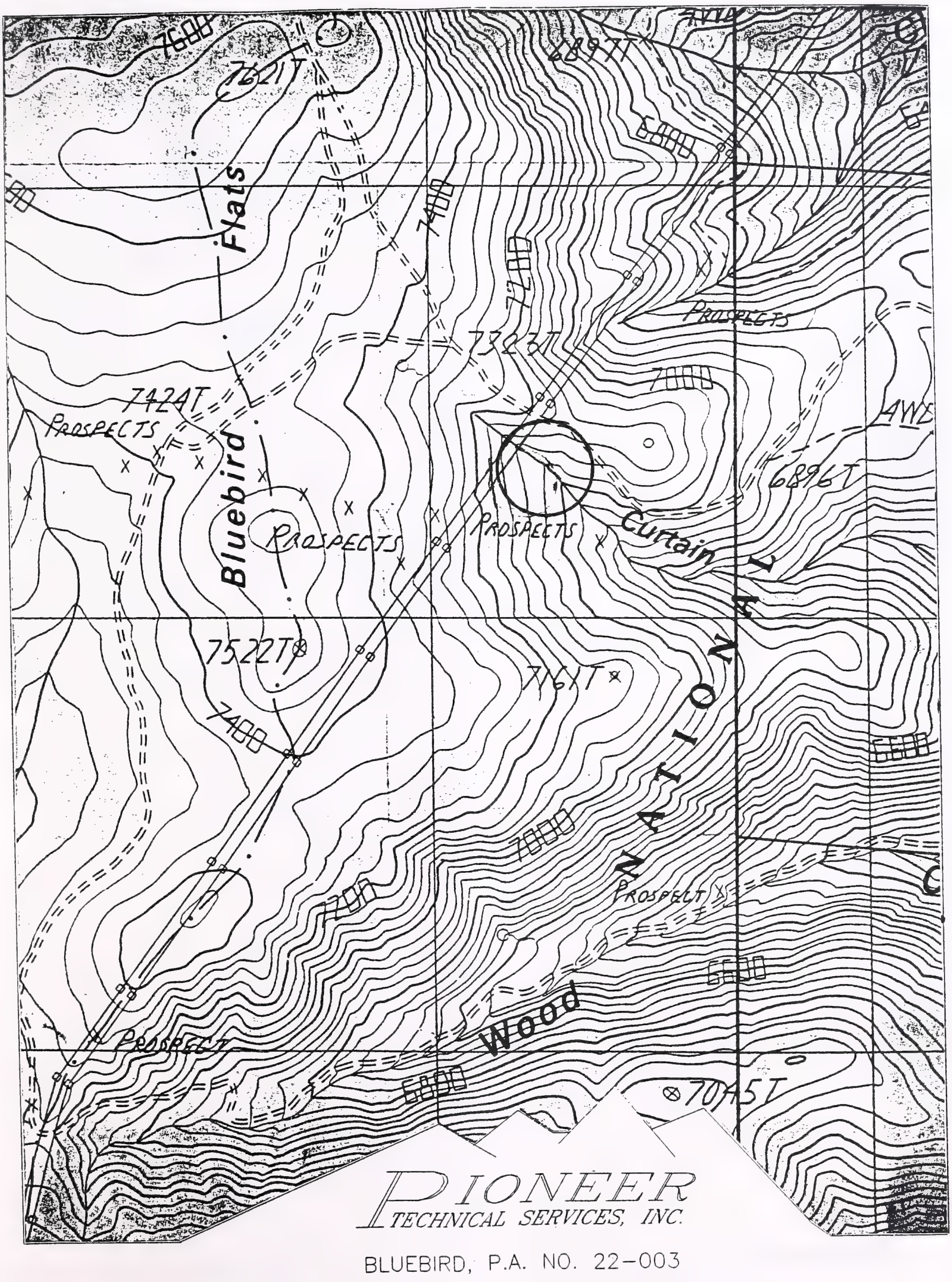
Mine Operation?
Shafts - Yes X, No ___, # 1, Comment In WR-1
Adits - Yes X, No ___, # 6, Comment All totally or partially collapsed
Pits - Yes ___, No X, # ___, Comment ___
Placers - Yes ___, No X, # ___, Comment ___
Other - Yes X, No ___, # 3, Comment Trenches

Mill Operation? Yes ___, No X. If yes answer the next three questions:

Period(s) of Operation: N/A

Origin of Ore Milled - Custom Mill ___ Dedicated Mill ___; Number and names of mines that supplied mill feed: N/A

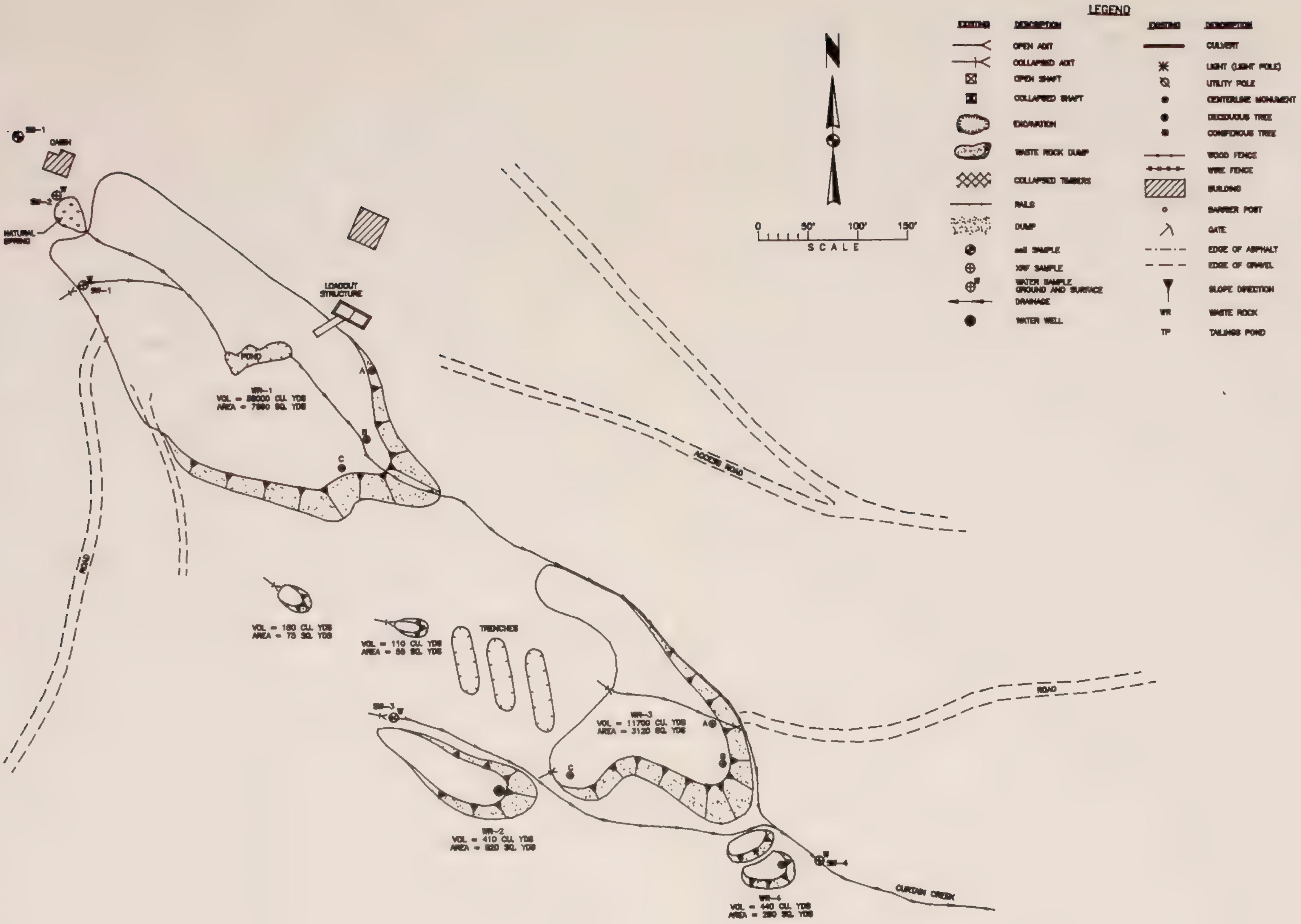
Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
N/A



PIONEER
TECHNICAL SERVICES, INC.

BLUEBIRD, P.A. NO. 22-003

T07N, R05W, SECTION 13



DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

PIONEER

TDH

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY

BLUEBIRD PA# 22-003
COLORADO DISTRICT JEFFERSON COUNTY

SHEET NO.

22-003.DWG SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. Waste Characteristics - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. TAILINGS IMPOUNDMENTS - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): N/A

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): N/A

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): N/A

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): N/A

Comments on potential for mitigation: N/A

SOURCE INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
WR-1A	WR	58,000	Upper site; east of wood loadout structure near top	None	< 3.5 (D)	0.06	22-003-WR-1	07/08/93 0900	T-Metals, ABA
WR-1B	WR		Upper site; east side, east lobe near top	None	< 3.5 (D)	0.06			
WR-1C	WR		Upper site; south lobe on top	None	< 3.5 (D)	0.05			
WR-2	WR	410	Lower site; northeast side of pile	None	5.2 (D)	0.04			
WR-3A	WR	11,700	Lower site; south of road, east lobe by stream	None	4.8 (D)	0.04	22-003-WR-2	07/08/93 0910	T-Metals, ABA
WR-3B	WR		Lower site; east lobe, south end near stream	None	5.2 (D)	0.04			
WR-3C	WR		Lower site; east of caved mine adit, west lobe	None	7.0 (D)	0.04			
WR-4	WR	440	Lower site; east end near top	None	5.6 (D)	0.04			
SS-1	BKGRND	N/A	Background soil 300 feet above upper discharging adit	N/A	6.0 (D)	0.03	22-003-SS-1	07/08/93 1155	T-Metals

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-003-WR-1 is composite of WR-1A through -1C, and WR-2. 22-003-WR-2 is composite of WR-3A through -3C, and WR-4.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes X , No ___, Number: 3 Identification: One on upper site (SW-1); two on lower site not sampled.

Filled shafts: Yes ___, No X , Number: ____ Identification: __________

Seeps/Springs: Yes X , No ___, Number: 1 Identification: SW-2

Groundwater wells within 4 miles?: Yes X , No ___;
Number of well logs: 24

Distance to nearest well used for drinking? 1 mile

Sample types: Flowing adits (AD); filled shafts (SH); Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable X , Possible____, Unlikely____.
Waste rock piles are uncontained sources that contain some elevated metal values. Adit discharge with shallow groundwater may be in contact with metals in mine dumps; pH of discharge is good.

Other observations/notes: N/A

GROUNDWATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	AD	Adit discharge at upper site	0.064 cfs (M)	6.66	530	100.9	6.3	49	N/A	22-003-SW-1	07/08/93 1030	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SW-2	SP	At upper site, spring headwaters	0.05 cfs (M)	8.14	120	98	7.6	38	N/A	22-003-SW-2	07/08/93 1045	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SW-3	AD	At lower site, upper adit discharge at WR-2	0.018 cfs (M)	7.95	140	172.7	5.9	36	N/A	N/A	N/A	Field Parameters

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): Adits are collapsed.

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes_X__, No___, Name(s): Spring upgradient of site is the headwaters for Curtain Creek, which flows through the site.

Dry streambeds: Yes____, No_X_, Name(s):____

Other surface water: Yes_X__, No___, Name(s)/Description: Spring originates at upper site and flows through upper and lower sites.

Waste materials within any floodplain: Yes_X__, No___ Source ID(s): WR in spring flow.

Approximate Flood frequency? _X_1 yr, ___10 yr, ___100 yr

Estimated seasonal flow of stream(s) (cfs)? 0.306 during investigation for spring below lower site (three adit discharges are added in).
High Flow: 1 cfs, **Average Flow:** 0.2 cfs

Distance between waste source(s) and nearest surface water body (ft)? WR-1 and WR-3 have spring draining adjacent or through.

Surface water draining onto or through waste sources: Yes_X__, No____,
Describe: Upper site has one adit draining through and spring draining through. Lower site has two adits draining through and spring draining through.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Wetland, agriculture

Observed erosional/sedimentation/stream turbidity problems? Yes____, No_X__, **Distance downstream (ft)?**________ **Describe/explain** (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
None observed during this investigation.

SURFACE WATER INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-4	SW	The downgradient spring sample after confluence with three adit discharges	7.70	290	183.2	9.1	30	0.306 cfs (M)	22-003-SW-4	07/08/93 1330	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993): ______

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? 3 acres

Wetlands present: Yes_X_, No___, Describe: Streamside willows and some grasses

Carbonate rocks/soils: Yes_X_, No___, Describe: Carbonate precipitates

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100_X_; 100-300___; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 1.5 miles

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Babits, Pierson, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH /MODERATE/LOW/NONE)
WR-1	SO3; pH	Moist	68,310	68,310	Yes	Low
WR-2	SO3	Moist	7,380	7,380	Yes	Low
WR-3	SO3	Moist	28,080	28,080	Yes	Low
WR-4	SO3	Moist	2,610	2,610	Yes	Low

Notes and Clarifications:

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No_X_,
Describe:______________________________

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300___;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments None

Evidence of recreational use on site: Yes___, No_X_, Describe:______

Accessibility - Fences, warning signs, closed roads? Unrestricted

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No_X_, Comment______
Wilderness Area - Yes___, No_X_, Comment______
T&E Species Habitat - Yes___, No_X_, Comment______
Bat Habitat - Yes___, No_X_, Comment______

Primary Drainage_X_; Secondary Drainage___; No Information___:

Riparian Habitat Quality - High___, Medium_X_, Low___
Wetlands Frontage - High___, Medium_X_, Low___
Fisheries Habitat and Species Classification - Not Rated
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes_X_, No___, Number_1_, types and locations:___
In WR-1, a shaft is partially collapsed.

Hazardous structures: Yes___, No_X_, Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes___, No_X_, Number____,
types and locations:______

Unstable waste piles, impoundments, undercut banks: Yes____, No_X_,
Number____, types and locations:______

Fire and/or Explosion hazards: Yes___, No_X_, Explain:______

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LABORATORY ANALYTICAL DATA

BLUEBIRD
PA NO. 22-003

Blue Bird PA# 22-003
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – BABITS
INVESTIGATION DATE: 07/08/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22–003–WR–1	587 JX	50.6	1.4	14.2	19.8	441	47000	0.407 J	1440 J	11	4990	11 J	1910	NR
22–003–WR–2	100 JX	37.1	0.5 U	4	3.9	18.9	31400	0.102 J	584 J	3 U	29	6 UJ	45	NR
BACKGROUND	28 JX	123	0.7	14.9	24.3	50.4	25400	0.052 J	1810 J	14	258	5 UJ	255	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22–003–WR–1	1.06	33.1	9.94	–23.	0.92	0.02	0.12	0.62	9.31
22–003–WR–2	0.21	6.56	78.6	72	0.1	0.03	0.08	0.94	77.7

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22–003–SW–1	142	12.1	25.1	16.2	6.83 U	1620 J	19000 J	0.038 U	4590 JX	12.7 U	8.21 JX	30.7 U	3600 J	206
22–003–SW–2	2.64 J	4.93	2.57 U	9.7 U	6.83 U	3.13 J	29.9	0.210 J	4.08 U	12.7 U	6.81 J	30.7 U	7.57 U	37.4
22–003–SW–4	31.7	8.77	12.2	9.7 U	9.33 J	605 J	4700 J	0.038 U	1390 JX	12.7 U	13 JX	30.7 U	1540 J	113

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2–N	CYANIDE
22–003–SW–1	375	< 5.0	173	< 0.05	NR
22–003–SW–2	91	< 5.0	11	0.05	NR
22–003–SW–4	217	< 5.0	81	< 0.05	NR

LEGEND

WR1 – Composite of subsamples WR1A, 1B, 1C, and 2.
WR2 – Composite of subsamples WR3A, 3B, 3C, and 4.
BACKGROUND – 300 feet above discharging adit.
From Bluebird Mine (22–003–SS–1).

SW1 – At uppersite adit discharge.
SW2 – At uppersite spring headwaters.
SW4 – The downgradient spring sample after confluence with three adit discharges.

XRF ANALYSIS RESULTS

BLUEBIRD
PA NO. 22-003

MDSL AMRB/PIONEER 4/9/93

Mine Name: Bluebird PA# 22-003
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-003-SS-1		17018.5	10043	2457.64		2350.35	33942.6			323.717		241.131
22-003-WR1-A		21731	3030.01	2315.27			45852		830.726	345.921		107.022
22-003-WR1-B		11066.9	8167.38	1888.49		5212.08	54977.4			4591.62	126.746	155.72
22-003-WR1-C		15752.2	13954.9	1563.29		2912.28	88836.4		358.688	2742.57	2360.31	170.146
22-003-WR3-A		17084.2	22650.4	1030.17		800.068 *	15515			74.0913 *	42.613 *	260.334
22-003-WR3-B		15624.7	34667.7	1842.61		1902.55	30000.5			96.7051 *	41.5786 *	381.967
22-003-WR3-C		23359	1226.51	1253.06		402.565 *	102672			111.753 *	374.243	35.6468
22-003-WR-1-COMP		17764 $	11770 $	2518 $	123 $	2331 $	63471 $		392 $	2134 $	560 $	204 $
22-003-WR-2		11142.6	29965.2	1735.39		3450.81	32473.1		74.455 *	592.106	63.7741 *	315.365
22-003-WR-2-COMP		20464 $	20817 $	1157 $	152 $	812 $	43206 $	244 $	60 $	64 $	135 $	275 $
22-003-WR-4		17168.2	21203.8	1035.61		993.905 *	12303.8				26.014 *	389.647
22-003-WR-4-DUP		16614	20966.5	1088.89		698.634 *	12588.8			47.3859 *	36.7795 *	384.167

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-003-SS-1	248.862			265.112	133.629			581.542			12.4273 *
22-003-WR1-A	185.496			7895.47	193.28		368.685	518.073	167.669 *		30.2242 *
22-003-WR1-B	150.683				95.6131			558.292			6.70673 *
22-003-WR1-C	155.183			1381.45	168.073			651.891	120.605 *		
22-003-WR3-A	111.382				157.697			818.888	101.043 *		8.83419 *
22-003-WR3-B	159.292			31.638 *	111.771			861.252	92.1751 *		7.47375 *
22-003-WR3-C	164.925			64.737 *	174.551			363.963	139.71 *		
22-003-WR-1-COMP	158 $		6 $	2454 $	153 $	96 $	75 $	682 $	85 $	9 $	8 $
22-003-WR-2	141.66			54.7479 *	96.5957			632.108			6.86235 *
22-003-WR-2-COMP	141 $		2 $	19 $	170 $			723 $	50 $	19 $	9 $
22-003-WR-4	114.542				171.22			809.786	78.7007 *		8.12421 *
22-003-WR-4-DUP	111.482				159.881			827.001	95.3127 *		10.2637 *

* – Estimated Quantity
$ – Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

BLUEBIRD
PA NO. 22-003

AIMSS SCORESHEET

SITE NAME: BLUEBIRD
PA NUMBER: 22-003

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	166.622
6	GW - TARGETS	WELLS - 1 MI. x 2.5		0.0
7		WELLS - 1 TO 4 MI		24
8		NEAREST WELL		0
9		TARGETS SCORE	LINES 6 + 7 + 8	24.0
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	1599571
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		50
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	750
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	182.923
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		0
18		WETLANDS		10
19		FISHERY		0
20		RECREATION		0
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	12
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	1646307
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
26A		CONTAINMENT		10
26B		DISTANCE TO POPULATION		5
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	50
27		LIKELIHOOD SCORE	LINES 25 + 26C	50
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.588
29	AIR - TARGETS	POPULATION - 4 MILES		30
30		NEAREST RESIDENCE		0
31		WETLANDS		10
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	40
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	1176
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		0
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		5
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	100
38		LIKELIHOOD SCORE	LINES 36 + 37C	100
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	0.537
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		0
41		NEAREST RESIDENCE		0
42		RECREATIONAL USE		0
43		TARGETS SCORE	SUM LINES 40 - 42	0
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	0
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**32.47**

SITE NAME: BLUEBIRD
PA NUMBER: 22-003

SITE SAFETY

LINE NO.				
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	100
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	0
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	100
9		POPULATION - 1 MILE		0
10	TARGETS	NEAREST RESIDENCE		0
11		RECREATIONAL USE		0
12		TARGETS SCORE	SUM LINES 9 - 11	0
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**0.00**

SUMMARY OF HISTORICAL ANALYTICAL DATA
FROM OTHER SOURCES

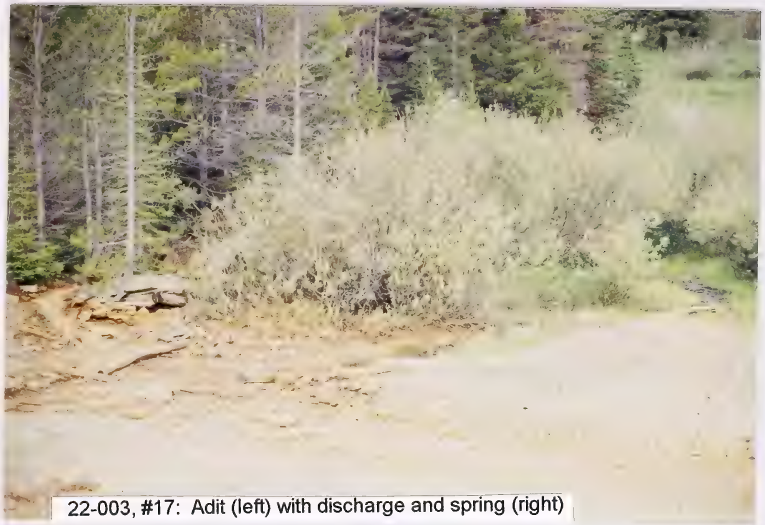
MDSL AMRB/PIONEER 4/9/93

Client Name: **CHEN-NORTHERN, INC. HELENA, MT**
Project No.: 87-911
Project Name: AMR RIT Sampling

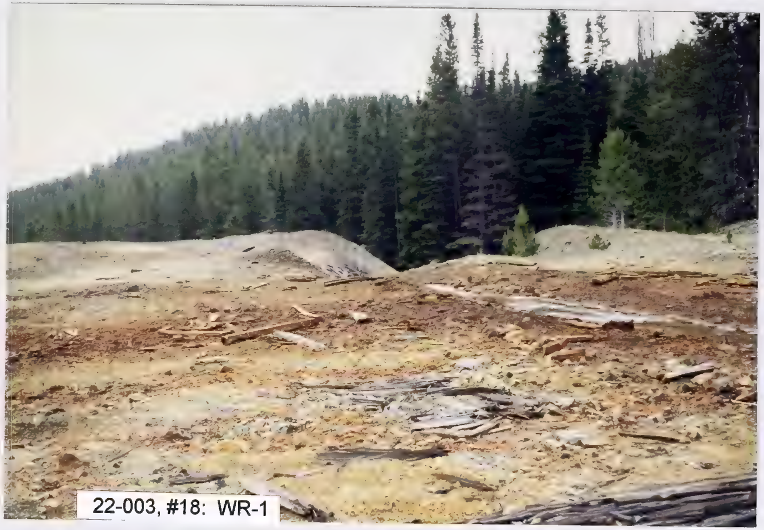
July 19, 1991
Sheet 4 of 5

Laboratory No.: 116947
Sample Name: BLUE BIRD DUMP
Sample Date: 05/31/91
Collected by: MICHAEL CORMIER
Time Sampled: None Given

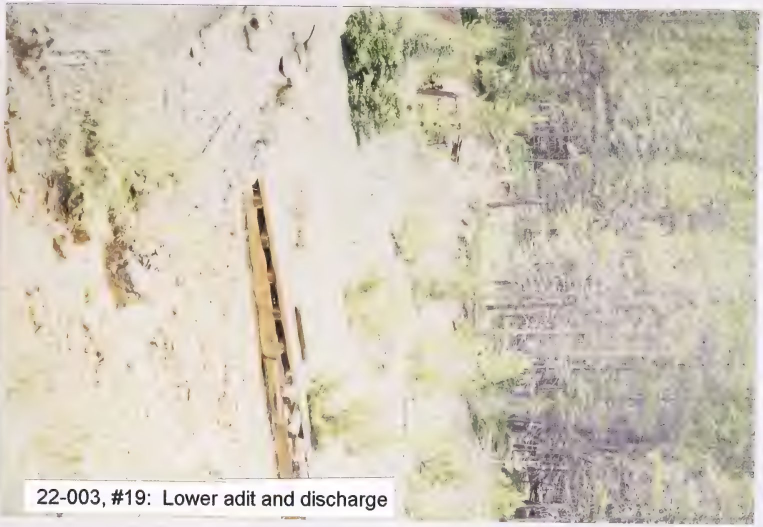
PARAMETER	AVERAGE VALUE	
INORGANICS:		
Electrical Conductivity	18.5	mmhos/cm
pH	2.0	S.U.
METALS:		
Arsenic as As (Dissolved) Saturated Paste Extract	10.8	mg/l
Arsenic as As (Total) Dry Basis	570	mg/kg
Cadmium as Cd (Dissolved) Saturated Paste Extract	28	mg/l
Cadmium as Cd (Total) Dry Basis	38.5	mg/kg
Chromium as Cr (Dissolved) Saturated Paste Extract	4	mg/l
Chromium as Cr (Total) Dry Basis	40.5	mg/kg
Lead as Pb (Dissolved) Saturated Paste Extract	2.5	mg/l
Lead as Pb (Total) Dry Basis	34,700	mg/kg
Mercury as Hg (Total) Dry Basis	<0.2	mg/kg
TCLP METALS:		
Arsenic TCLP	<1	mg/l
Cadmium TCLP	0.169	mg/l
Chromium TCLP	<0.02	mg/l
Lead TCLP	36	mg/l
Mercury TCLP	<0.0016	mg/l



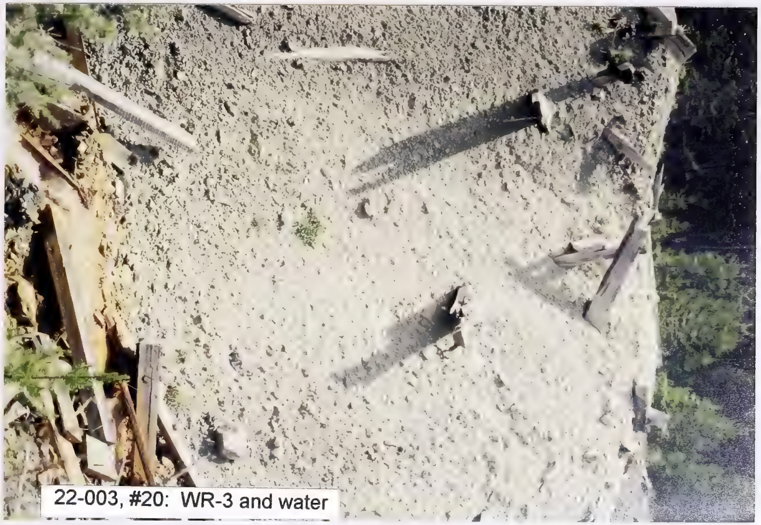
22-003, #17: Adit (left) with discharge and spring (right)



22-003, #18: WR-1



22-003, #19: Lower adit and discharge



22-003, #20: WR-3 and water

MONTANA DEPARTMENT OF STATE LANDS
ABANDONED MINE RECLAMATION BUREAU

HAZARDOUS MATERIALS INVENTORY SITE INVESTIGATION LOG SHEET

Mine/Site Name: CORBIN FLATS **PA#:** 22-004

Date: July 12, 1993 **Time:** 0845-1945

Field Team Leader: Tuesday, Pioneer

Sampling Personnel: Belanger, Pioneer
Lasher, Pioneer

Visitors: People riding 4-wheelers

Weather/Seasonality Observations: Cool; mostly cloudy; windy; cool, wet spring and summer.

Photographic Log (Film Roll and Photo No.'s/Video Tape Number): #1-#3: Spring Creek cutting into tailings; #4-#11: Panorama of east (lower) end of tailings; #12: Building foundations; #13-#16: Panorama of central area; #17: Closeup of building foundations; #18-#22: Panorama of west (upper) end; #23: SW-1 location; #24,#25: Mill site in Corbin; #26: SW-2 location; #27: GW-1 location, residence. Video Tape No. 1

General Comments/Observations (not covered specifically in attached Inventory Forms): Tailings have been significantly moved around; in some cases, piled away from Spring Creek. Looks as though a channel was built along the north side of the site, parallel to road, to carry Spring Creek. However, creek flows through tailings now; has returned to original course. Not sure how Tunnels pump house at west end of site affects water flow or quality, especially turbidity. Some parts of site have been covered with fill material and are revegetated.

Other Hazardous Materials/Substances Present: N/A

General Comments on Potential Remedial Alternatives: Re-route stream around/through tailings; stabilize tailings with respect to steep banks and wind blown dust. Given past failure to re-route, should use existing meandering stream bed and move tailings away from stream.

I. BACKGROUND INFORMATION

This information is to be collected to the extent practical prior to conducting the Site Investigation. Data gaps shall be filled in during the investigation.

Mine/Site Name(s): CORBIN FLATS PA#: 22-004

Legal Description: T 7N ;R 4W ;Sec. 1 , S 1/2___1/4___1/4

County: JEFFERSON Mining District: COLORADO

Latitude: N 46° 23' 13" Longitude: W 112° 02' 30"

Primary Drainage Basin and Code: Prickly Pear Creek/10030101
Secondary Drainage Basin: Spring Creek

USGS Quadrangle map name(s): Jefferson City

Mine Type/Commodities: Mill/Copper, Lead, Zinc
Activity Status: Active___,Inactive/Exploration___,Abandoned X .
Ownership status: Known YX N__; private/public? Private
Owner, Agent, or Contact(Include address and phone when available): Diane Tintinger Thompson, P.O. Box 189, Jefferson City, MT 59638; Tizer View Land & Livestock Co., c/o Antone and Marian Morris, 629 Helena Avenue, Helena, MT 59601; Ted and Julie Kresge, Box 114, Jefferson City, MT 59638; Burlington Northern, Property Management, 304 Inverness Way South, Englewood, CO 80112; Alta Mines Corp., c/o Montana Tunnels Mining, Inc., P.O. Box 176, Jefferson City, MT 59638.

Relationship to other mines/sites in the area/district: Downstream from all major mines in district; mill in Corbin.

Regulatory Status (Activity by other agencies)? Hardrock permits? Past Reclamation Activities? Possibly covered under MT Tunnels Mining permit; stream by-passing ditch (now non-functional) may have been part of reclamation.

General site features: Elevation 4620' , Slope 2% to East ,
Aspect Southwest

Land use: Mining___, Recreational X , Residential X , Urban___,
Agricultural X , Other(Specify)

Area of disturbed/unvegetated lands? 40 acres.
Dimensions: 1.1 miles x 300 feet

Predominant vegetation types: Bluebunch wheatgrass/needle-and-thread habitat type.

Access: roads - good X ,poor___,4wd___,trail___.
Other logistical considerations (proximity to other sites). On road leading to most mines in the district; before Wickes Tails.

Well logs within 1 mile radius; water rights 15 mi downstream (Attach MBMG Well Log Printout(s): There are 43 well logs within a 1 mile radius.

General site geologic, hydrologic, and hydrogeologic settings (Also note presence of radioactive minerals). Perennial Spring Creek flows southwest through the site; confluence with Prickly Pear Creek is approx. 1 1/2 to 2 miles below the site. The site is most likely underlain by quartz monzonite of the Boulder Batholith or an erosional remnant of andesite which the Batholith intruded. Deposits in the area are vein and associated with the contact between the quartz monzonite and andesite.

Mining/milling history, ore type/tenor, host rock, gangue: Veins in the area carried tourmaline, quartz and crushed country rock as gangue minerals. Chief ore minerals were argentiferous galena, sphalerite, chalcopyrite, and tetrahedrite. Gold is present in most of the ores. Arsenopyrite, pyrite, and rhodochrosite are common accessory minerals. First concentrator with 150-ton capacity was built in 1884 and later increased to 500 tpd. A second concentrator was built in 1896 to retreat tailings. In 1925, a third concentrator was built to retreat tailings. Approx. 100,000 tons of tailings were treated. From 1938 to 1941, 146,000 tons of tailings were treated.

Mine Operation?
Shafts - Yes___, No X , # ____, Comment
Adits - Yes___, No X , # ____, Comment
Pits - Yes___, No X , # ____, Comment
Placers - Yes___, No X , # ____, Comment
Other - Yes___, No X , # ____, Comment

Mill Operation? Yes X , No____. If yes answer the next three questions:

Period(s) of Operation: 1884 to approx. 1890; 1925 to 1941

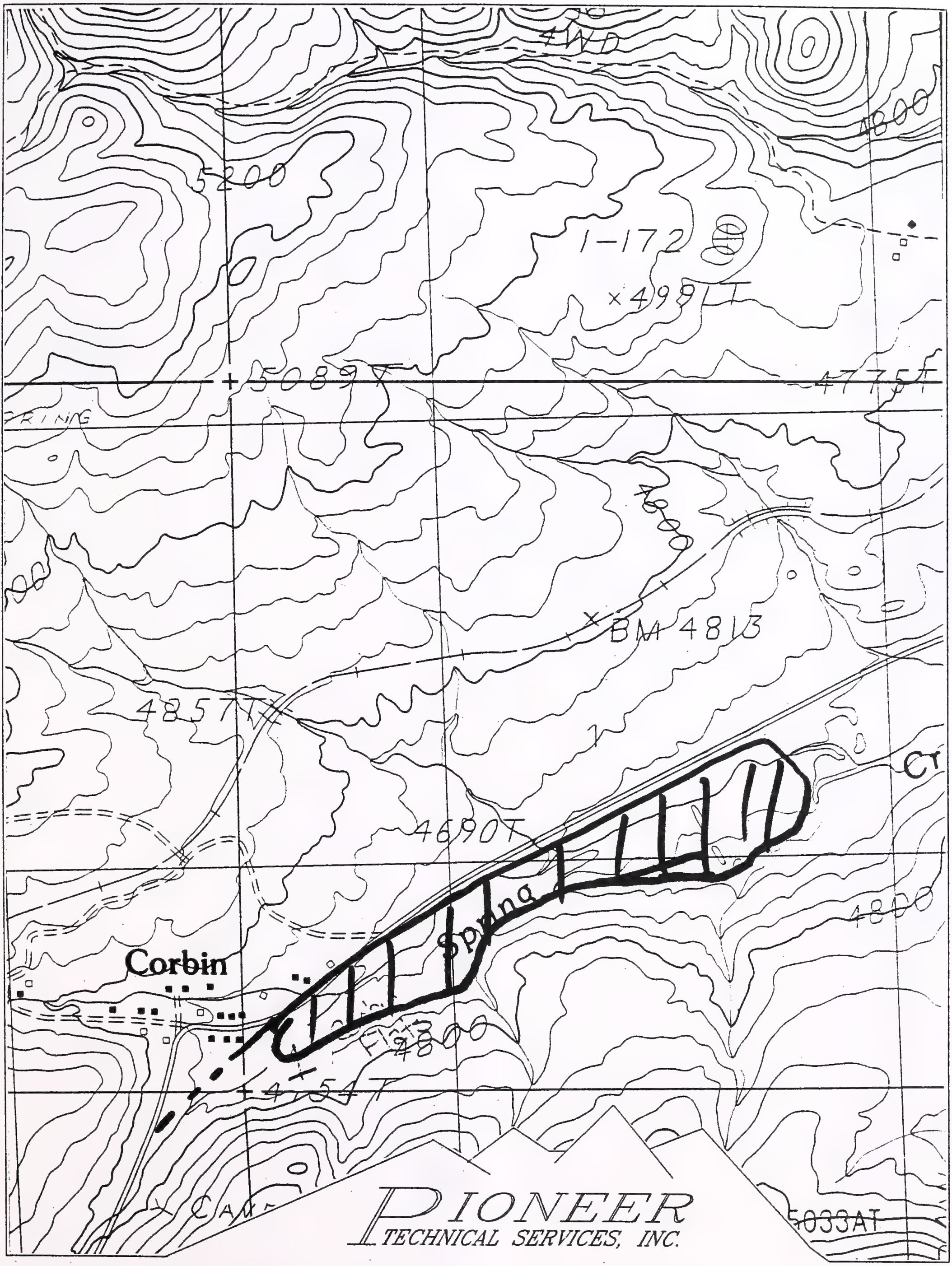
Origin of Ore Milled - Custom Mill X Dedicated Mill___; Number and names of mines that supplied mill feed: Alta, Bertha, and Gregory mines

Process? Hg-amalgam, CN⁻ leach (vat, heap), floatation, smelting?
Floatation

Montana Bureau of Mines and Geology
Water Well Log Data

10/15/1993

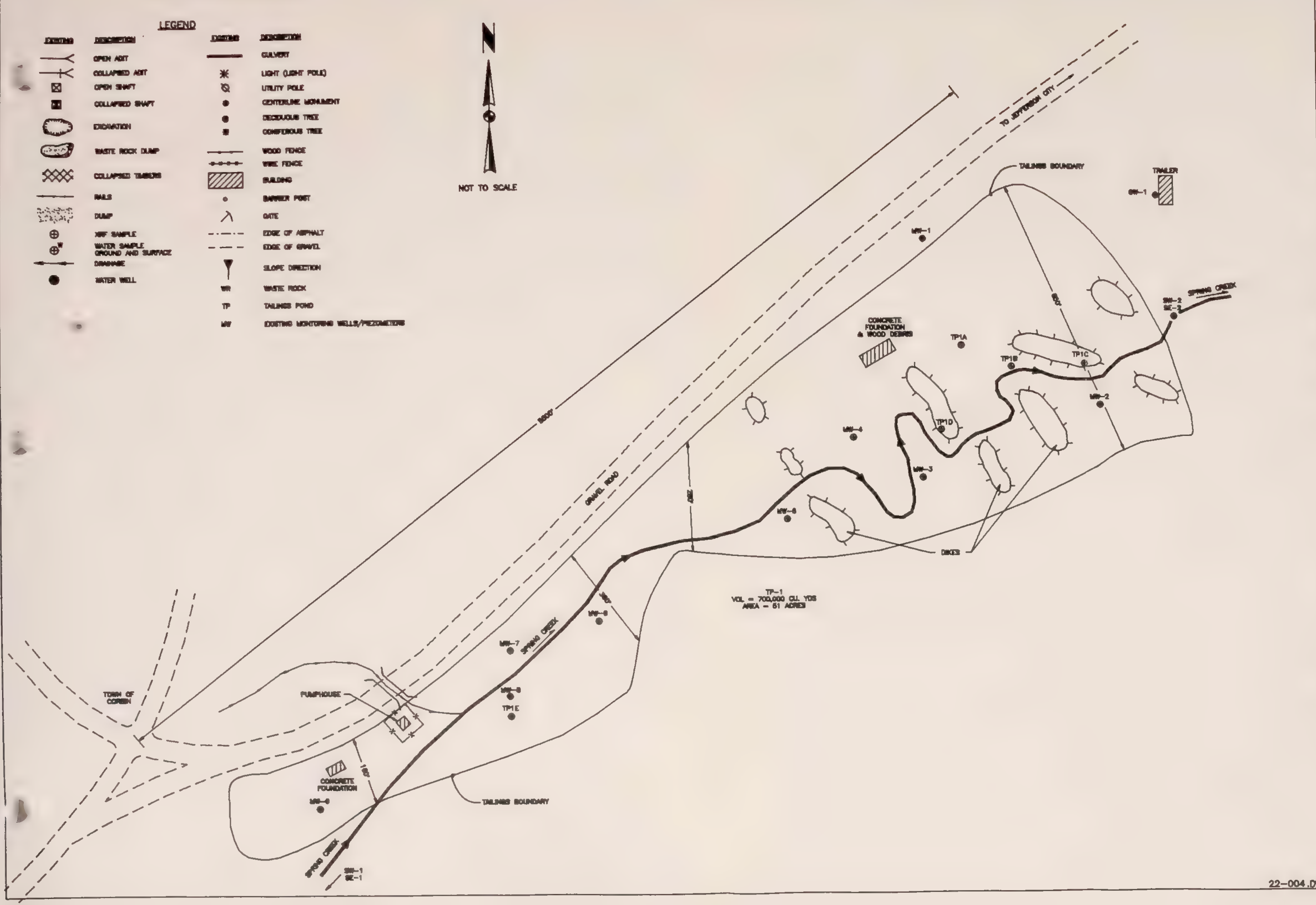
Well No.	Location	Depth	Yield	Static Water Level
M:55780	07N 04W 01 A	185.0	15.0	41.00 ①
M:120385	07N 04W 01 BB	100.0	12.0	20.00 ②
M:55781	07N 04W 02	65.0	1.0	0.00 ③
M:55782	07N 04W 02 B	0.0	100.0	12.00 ④
M:55783	07N 04W 02 BC	152.0	500.0	8.00 ⑤
M:55784	07N 04W 02 DD	38.0	10.0	15.00 ⑥
M:55794	07N 04W 11 ACD	23.0	15.0	6.00 ⑦
M:55795	07N 04W 11 CA	54.0	40.0	6.00
M:5432	07N 04W 11 CDCD	84.3	0.0	7.34
M:57315	08N 03W 31 D	145.0	12.0	31.00 ⑧
M:57316	08N 03W 31 DA	44.0	7.0	6.00 ⑨
M:55744	07N 03W 06	188.0	10.0	120.00 ⑩
M:55745	07N 03W 06	46.0	20.0	4.00 ⑪
M:55749	07N 03W 06	70.0	0.0	25.00 ⑫
M:55752	07N 03W 06	145.0	20.0	20.00 ⑬
M:55754	07N 03W 06	380.0	20.0	50.00 ⑭
M:55750	07N 03W 06	100.0	50.0	22.00 ⑮
M:55753	07N 03W 06	225.0	7.0	10.00 ⑯
M:55748	07N 03W 06	170.0	28.0	30.00 ⑰
M:55746	07N 03W 06	20.0	8.0	0.00 ⑱
M:55751	07N 03W 06	220.0	15.0	30.00 ⑲
M:55755	07N 03W 06	205.0	12.0	60.00 ⑳
M:55747	07N 03W 06	40.0	10.0	10.00 ㉑
M:55756	07N 03W 06 A	185.0	50.0	40.00 ㉒
28020	07N 03W 06 AAC	121.0	60.0	17.00 ㉓
55758	07N 03W 06 AB	37.0	15.0	20.00 ㉔
M:55757	07N 03W 06 AB	120.0	8.0	25.00 ㉕
M:55759	07N 03W 06 AB	100.0	30.0	30.00 ㉖
M:131211	07N 03W 06 ABC	160.0	12.0	20.00 ㉗
M:55760	07N 03W 06 B	350.0	2.0	11.00 ㉘
M:55761	07N 03W 06 B	350.0	2.0	11.00 ㉙
M:55762	07N 03W 06 BAD	28.0	30.0	22.00 ㉚
M:55763	07N 03W 06 BC	257.0	90.0	20.00 ㉛
M:55764	07N 03W 06 BD	34.0	6.0	23.00 ㉜
M:55765	07N 03W 06 BD	220.0	50.0	30.00 ㉝
M:127877	07N 03W 06 BD	140.0	20.0	20.00 ㉞
M:55766	07N 03W 06 BDA	37.0	0.0	24.00 ㉟
M:122590	07N 03W 06 BDA	129.0	20.0	37.00 ㊱
M:123773	07N 03W 06 BDA	129.0	0.0	23.75
M:55767	07N 03W 06 BDA	146.0	4.0	60.00 ㊲
M:55768	07N 03W 06 CA	165.0	20.0	60.00 ㊳
M:122356	07N 03W 06 DB	220.0	20.0	40.00 ㊴
M:55769	07N 03W 06 DBB	36.0	20.0	26.00 ㊵
M:55770	07N 03W 06 DD	41.0	10.0	20.00 ㊶
M:55772	07N 03W 07 AC	20.0	25.0	20.00
M:55771	07N 03W 07 AC	27.0	20.0	8.00 ㊷
M:55773	07N 03W 07 AD	35.0	20.0	10.00 ㊸



PIONEER
TECHNICAL SERVICES, INC.

CORBIN FLATS, P.A. NO. 22-004

T07N, R04W, SECTION 01
SCALE: 1" = 1000'



22-004.DWG

DRAWN MWC DATE 9/93
DESIGNED TPR JOB NO. 93-17
APPROVED F.B. NO.

PIONEER

TD&H

THOMAS, DEAN & HOSKINS INC.
ENGINEERING CONSULTANTS
GREAT FALLS–BOZEMAN–KALISPELL MONTANA
SPOKANE WASHINGTON

MONTANA DEPT. OF STATE LANDS
HAZARDOUS MATERIAL INVENTORY
CORBIN FLATS PA# 22-004
COLORADO DISTRICT JEFFERSON COUNTY

SHEET NO.

SHEETS

II. INFORMATION COLLECTED ON SITE

A. SOLID MATRIX WASTE CHARACTERIZATION

1. **Waste Characteristics** - Use table on following page.

Unique source identification (e.g. west waste rock dump #2) and abbreviation on sketch map and source list (e.g. WWRD2). Locate source on sketch map with any measured distances from at least two landmarks.

Source types: Waste rock dumps and piles (WR); tailings impoundments and piles (TAIL); vats, vessels, tanks that contain something (VAT); barrels - not empty (BAR); soils contaminated by spills or leaks (SP); suspected asbestos containing materials (ACM); garbage/refuse/junk dumps (DMP); other sources (OTH).

Source size: Estimated volumes (cu. yards or feet, # of barrels) for each source identified above.

Location/Description: List location and description for each source identified above.

Waste containment: Is the source contained with respect to groundwater, surface water, and airborne releases or the potential to release? Good, adequate, poor, or none. Are waste structures / vessels sound, are runon/runoff controls in place, are wastes covered or vegetated, pond liners intact?

2. **TAILINGS IMPOUNDMENTS** - If tailings impoundments are also present, complete the following questions.

Describe the tailings grain size distribution (approximate % sand, silt, & clay): 70% sand/fine sand; 30% silt and clays.

Determine tailings impoundment depth and describe stratification of the tailings if observable (based on texture and color): Varies from 1 foot (west end) to 12 feet (center).

Are tailings wet or dry (Describe location of partially wetted tailings impoundments): Dry

Describe condition of the tailings impoundment (Note condition of dams or structures, location of breaches): All dikes are breached by Spring Creek.

Comments on potential for mitigation: Partial cover and revegetation is taking place, continue/finish; move creek out of tailings.

SOURCE INVENTORY FORM

SAMPLERS: Tuesday, Belanger, Lasher

SOURCE I.D. NO.	SOURCE TYPE	SOURCE VOLUME (yd^3)	LOCATION/DESCRIPTION	CONTAIN-MENT	pH SU (D/S)*	RADIO-ACTIVITY (mR/HR)	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
TP-1A-A	TAIL	700,000	East of concrete foundation; 0′-3′, orange silt	None	5.5 (D)	0.06	22-004-TP-1	07/12/93 1930	T-Metals, ABA, CN
TP-1A-B	SOIL		East of concrete foundation; 3′-5′, natural soil, black loam	None	6.0 (D)	0.04	N/A	N/A	XRF Analysis
TP-1B-1	TAIL		Stream cut southeast of TP-1A; 0′-2′, tan silt/clay	None	4.5 (D)	0.03			
TP-1B-2	TAIL		Stream cut southeast of TP-1A; 2′-7′, orange silt	None	3.6 (D)	0.03			
TP-1B-3	TAIL		Stream cut southeast of TP-1A; 7′-10′, orange silt	None	4.2 (D)	0.03			
TP-1C-1	TAIL		Stream cut near west end of site; 0′-4.5′, orange silt	None	< 3.5 (D)	0.03			
TP-1C-2	TAIL		Stream cut near west end of site; 4.5′-9′, orange/gray clay	None	< 3.5 (D)	0.035			
TP-1C-3	TAIL		Stream cut near west end of site; 9′-11′, orange silt	None	< 3.5 (D)	0.04			
TP-1C-4	TAIL		Stream cut near west end of site; 11′-13′, gray clay	None	4.2 (D)	0.035			
TP-1D-1	TAIL		South of TP-1A; 0′-6′, tan sand	None	< 3.5 (D)	0.02	22-004-TP-2	07/12/93 1945	T-Metals, ABA, CN
TP-1D-2	TAIL		South of TP-1A; 6′-9′, orange silt	None	< 3.5 (D)	0.03			
TP-1D-3	TAIL		South of TP-1A; 9′-11′, brown sand	None	< 3.5 (D)	0.05			
TP-1D-4	TAIL		South of TP-1A; 11′-14′, black clay	None	< 3.5 (D)	0.03			
TP-1E-1	TAIL		Southeast end of TP-1, south of Spring Creek; black/blue hard material on surface	None	5.0 (D)	0.05	N/A	N/A	XRF Analysis
TP-1E-2	TAIL		Southeast end of TP-1, south of Spring Creek; 0′-8", yellow silt/clay	None	4.2 (D)	0.04	N/A	N/A	XRF Analysis
TP-1E-3	TAIL		Southeast end of TP-1, south of Spring Creek; 8"-5′, underlying soil	None	3.6 (D)	0.04	N/A	N/A	XRF Analysis

*D-Direct reading(Kelway Meter); S-Saturated Paste(Orion Meter)

Comments or deviations from SOPs: 22-004-TP-1 is composite of TP-1A-A, TP-1B-1 through -1B-3, and TP-1C-1 through -1C-4. 22-004-TP-2 is composite of TP-1D-1 through -1D-4.

B. GROUNDWATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map.

Flowing adits: Yes___, No X , Number:____ Identification:______________

Filled shafts: Yes___, No X , Number:____ Identification:______________

Seeps/Springs: Yes___, No X , Number:____ Identification:______________

Groundwater wells within 4 miles?: Yes X , No___;
Number of well logs: 153

Distance to nearest well used for drinking? 0.2 mile

Sample types: Flowing adits (AD); filled shafts (SH);
Residential wells (RW); Monitoring wells (MW); Seeps/Springs (SP).

Field Measurements: Flow (measured or estimated), pH (meter), Eh (meter), SC (meter), temperature (meter), Alkalinity (test kit)?

Potential for groundwater contamination (explain)?
Definite____, Probable____, Possible X , Unlikely____.
Water beneath tailings may be deep; large uncontained source containinc elevated metal values.

Other observations/notes: Five monitoring wells (4" id steel with 2" PVC) on lower tailings; locked (one is shot up). One with 4" steel, four with 4" PVC holes that may be wells on upper tailings above and below pump house; probably MT Tunnels wells.

GROUNDWATER INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SOURCE	FLOW* cfs/gpm	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Depth ft	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
GW-1	RW	Residential well	5 gpm @ 5 min. (M)	8.11	1080	-151.5	12.4	228	185	22-004-GW-1	07/12/93 1820	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3

FLOW: Estimated (E) or Measured (M) from adit, shaft, seep or spring?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

C. SURFACE WATER CHARACTERISTICS

Use table on following page. Identify all locations on sketch map or topographic map. Indicate drainage patterns (run-on/runoff) and directions on sketch maps.

Flowing streams: Yes X, No ___, Name(s): Spring Creek

Dry streambeds: Yes ___, No X, Name(s): ___

Other surface water: Yes ___, No X, Name(s)/Description: ___

Waste materials within any floodplain: Yes X, No ___ Source ID(s): TP-1 and TP-2

Approximate Flood frequency? X 1 yr, ___ 10 yr, ___ 100 yr

Estimated seasonal flow of stream(s) (cfs)? 2 cfs
High Flow: 30 cfs, Average Flow: 3.0 cfs

Distance between waste source(s) and nearest surface water body (ft)? 0 feet

Surface water draining onto or through waste sources: Yes X, No ___,
Describe: Spring Creek meanders through tailings for approx. 1 mile.

Surface water use within 15 miles downstream? (Drinking water supply, irrigation, residential use? Sensitive environments within 15 miles downstream? Park, Wilderness, Fishery, Wetland, T&E habitat?)
Possible wetlands, agriculture; Prickly Pear Creek - recreation, fishery, wetlands, irrigation, agriculture

Observed erosional/sedimentation/stream turbidity problems? Yes X, No ___, Distance downstream (ft)? 5000' Describe/explain (Note streambank stability and condition of streambank vegetation and any manmade structures or channel changes present):
Stream very turbid below pump house discharge; sedimentation (tailings) downstream to end of tailings.

SURFACE WATER INVENTORY FORM

SAMPLERS: Tuesday, Belanger

SAMPLE I.D. NO.	SAMPLE TYPE	DESCRIPTION OF SAMPLE LOCATION	pH SU	SC µS/cm @ 25°C	Eh mV	Temp °C	ALK. mg/L as $CaCO_3$	Flow* cfs/gpm	LAB. SAMPLE NO.	DATE/ TIME	ANALYSES
SW-1	SW	Upstream in Spring Creek	8.25	580	178.5	11.4	63	2.025 cfs (M)	22-004-SW-1	07/12/93 1045	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-1	SE	Upstream in Spring Creek	N/A	N/A	N/A	N/A	N/A	N/A	22-004-SE-1	07/12/93 1045	T-Metals
SW-2	SW	Downstream of tailings in Spring Creek	7.56	600	221.9	13.3	53	1.95 cfs (M)	22-004-SW-2	07/12/93 1100	T-Metals, TDS, Hardness, Cl, SO4, NO2/NO3
SE-2	SE	Downstream of tailings in Spring Creek	N/A	N/A	N/A	N/A	N/A	N/A	22-004-SE-2	07/12/93 1100	T-Metals

FLOW: Estimated (E) or Measured (M)?

Comments or Deviations from the SOPs (Pioneer SAP, 1993):

D. ACID MINE DRAINAGE (AMD) POTENTIAL

Evaluate each source in table on next page.

AMD Characteristics:

Presence and abundance of sulfides?	(SO_3)
Presence of evaporative salt deposits?	(ESD)
Discolored or turbid seepage?	(SPG)
Presence of long filamentous algae in drainages, mosses in moist areas?	
Presence of ferric hydroxide precipitates?	(FEOX)
Presence of burned or stressed vegetation?	(VEG)
pH ≤ 5.0	(pH)

General Potential for AMD Mitigation:

Area available for treatment (acres)? Approx. 10 to 20 acres

Wetlands present: Yes___, No X , Describe:

Carbonate rocks/soils: Yes___, No X , Describe:

E. AIR PATHWAY CHARACTERISTICS

Population within 4-mile radius: 1-10___; 10-30___; 30-100___; 100-300 X ; 300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___; Comments

Nearest residence(ft or miles)? 0.2 mile/Corbin townsite is possibly located on tailings near mill.

For each source (table next page):

Available fine materials? Surface area?

Uncovered and unvegetated? Wet or dry?

Overall dust propagation potential:
observed high moderate low none

ACID DRAINAGE/AIR PATHWAY INVENTORY FORM

SAMPLERS: Tuesday, Belanger, Lasher

SOURCE I.D. NO.	ACID MINE DRAINAGE CHARACTERISTICS (LIST)	MOISTURE CONTENT (WET/DRY/PARTIAL)	SURFACE AREA (SQUARE FEET)	UNCOVERED/UNVEGETATED AREA (SQUARE FEET)	AVAILABLE FINES (YES/NO)	DUST PROPAGATION POTENTIAL (OBSERVED/HIGH/MODERATE/LOW/NONE)
TP-1	FEOX, pH	Dry	2,220,000	1,110,000	Yes	High

Notes and Clarifications: Anecdotal evidence of blowing dust by MDHES investigators.

F. DIRECT CONTACT CHARACTERISTICS

Residents or workers within 200 feet of sources: Yes____, No X ,
Describe:____

Population within 1 mile: 1-10___; 10-30___; 30-100___; 100-300 X ;
300-1,000___; 1,000-3,000___; 3,000-10,000___; 10,000 or greater___;
Comments____

Evidence of recreational use on site: Yes X , No___, Describe:
Observed people riding 4-wheelers; gunshells; fireworks.

Accessibility - Fences, warning signs, closed roads? Stock fence down in some places; gates open; signs posted.

Sensitive environments on-site or adjacent to site:

State or National Parks - Yes___, No X , Comment________________
Wilderness Area - Yes___, No X , Comment________________
T&E Species Habitat - Yes___, No X , Comment________________
Bat Habitat - Yes___, No X , Comment________________

Primary Drainage___; Secondary Drainage X ; No Information___:

Riparian Habitat Quality - High___, Medium X , Low___
Wetlands Frontage - High___, Medium X , Low___
Fisheries Habitat and Species Classification - 3
Sport Fishery Classification - Not Rated

G. SAFETY CHARACTERISTICS

Verify completeness of AMRB Inventory

Hazardous openings: Yes___, No X , Number____, types and locations:___

Hazardous structures: Yes___, No X , Number____, types and locations:_

Unstable highwalls, pits, trenches, slopes: Yes X , No___, Number 1/5, types and locations: Stream is undercutting tailings banks in a least five places, which is creating highwalls.

Unstable waste piles, impoundments, undercut banks: Yes X , No____, Number 1/5 , types and locations: Stream undercutting tailings banks in at least five places.

Fire and/or Explosion hazards: Yes___, No X , Explain:________________

Bibliography

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MDHES/WQB, Analytical Data for Corbin Flats, 1975, 1977-1981.

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MDSL/AMRB Files, Abandoned Mine Reclamation Inventory Field Form for the Corbin Flats site, Prepared by Delta Engineering, Date Unknown.

MDSL/AMRB Files, Problem Area Data Form for the Corbin Flats site, Prepared by Mark Calstrom and Ben Mundie, September 17, 1979.

Mining Record, The, "Montana Mining Towns May Boom Again," Volume 93, No. 47, November 25, 1981.

USGS, Greater Helena Mining Region, Montana, Bulletin 842, Author Unknown, pp. 244-245.

USGS, Topographic Map, Jefferson City, Montana, 7 1/2 minute Quadrangle, 1985.

LABORATORY ANALYTICAL DATA

CORBIN FLATS
PA NO. 22-004

Corbin Flats PA# 22-004
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER – TUESDAY
INVESTIGATION DATE: 07/12/93

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Co (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Hg (mg/Kg)	Mn (mg/Kg)	Ni (mg/Kg)	Pb (mg/Kg)	Sb (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22–004–SE–1	104 J	34.5	3.2	4.3	4.5 J	76.6 J	12800	0.104	458	5 J	223 J	6 UJ	506	NR
22–004–SE–2	63 J	20.3	3.3	3	1.6 U	161 J	9460	0.026	1320	3 J	204 J	7 UJ	561	NR
22–004–TP–1	1270 J	66.5	61.7	2.6	2.3 J	897 J	20400	0.31	20400	20 J	7540 J	104 J	9360	NR
22–004–TP–2	975 J	87.9	104	5.1	4.2 J	2010 J	27800	1.45	17500	19 J	15500 J	194 J	13500	NR
BACKGROUND	187 J	92.1	6.6	11.4	8.4 J	232 J	31600	0.029	1040	11 J	447 J	6 UJ	618	NR

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	TOTAL SULFUR ACID BASE t/1000t	NEUTRAL. POTENT. t/1000t	SULFUR ACID BASE POTENT. t/1000t	SULFATE SULFUR %	PYRITIC SULFUR %	ORGANIC SULFUR %	PYRITIC SULFUR ACID BASE t/1000t	SULFUR ACID BASE POTENT. t/1000t
22–004–TP–1	1.5	46.9	3.2	–43.	0.59	0.56	0.35	17.5	–14.3
22–004–TP–2	2.66	83.1	66.6	–16.	0.84	1.07	0.75	33.4	33.2

WATER MATRIX ANALYSES

Metals in Water
Results in ug/L

FIELD ID	As	Ba	Cd	Co	Cr	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Zn	HARDNESS CALC. (mg CaCO3/L)
22–004–GW–1	9.12 J	30.70	4.03 J	9.70 U	6.83 U	3.70	76.1 JX	0.120	18.1	12.7 U	3.95	30.7 U	66.8 J	197
22–004–SW–1	20.51 J	8.40	241 J	11.00	6.83 U	233	630 JX	0.095	8580	59.3	17.3	44.1	26300 J	536
22–004–SW–2	103	50.6	25.1 J	9.7 U	7.97	348	6530	0.094	8830	12.7 U	960	30.7 U	5630	215

U – Not Detected; J – Estimated Quantity; X – Outlier for Accuracy or Precision; NR – Not Requested

Wet Chemistry
Results in mg/l

FIELD I.D.	TOTAL DISSOLVED SOLIDS	CHLORIDE	SULFATE	NO3/NO2–N	CYANIDE
22–004–GW–1	686	< 5.0	156	< 0.05	NR
22–004–SW–1	326	< 5.0	144	0.36	NR
22–004–SW–2	406	< 5.0	206	0.24	NR

LEGEND

SE1 – Upstream in Spring Creek.
SE2 – Downstream of tailings in Spring Creek.
TP1 – Composite of subsamples TP1A–A, 1B–1 through 1B–3, and 1C–1 through 1C–4.
TP2 – Composite of subsamples TP1D–1 through 1D–4.
BACKGROUND – From the Bertha Mine (22–002–SS–1).
GW1 – Residential well.
SW1 – Same as sample SE1.
SW2 – Same as sample SE2.

XRF ANALYSIS RESULTS

CORBIN FLATS
PA NO. 22-004

MDSL AMRB/PIONEER 4/9/93

Mine Name: Corbin Flats PA# 22-004
XRF Field Analyses
Results in PPM

XRF SAMPLE ID	CrHI	K	Ca	Ti	CrLO	Mn	Fe	Co	Cu	Zn	As	Sr
22-004-TP1A-A		31674	21236.8	1328.92		22368.5	25090.5		1108.18	12070.9		124.677
22-004-TP1A-B		22831.4	12546.8	3203.18		3923.26	32682.8		87.4876 *	1727.47		422.108
22-004-TP1B-1		19318.7	26191.1	824.72		24834	16286.9		530.669	4828.22		180.973
22-004-TP1B-2		17071	21772.1	774.976		21599.5	14169.5		423.246	5907.76		163.73
22-004-TP1B-3		12292.4	11695.3	548.933		24960.7	18633.7		900.839	8254.32	2725.51	83.1613
22-004-TP1C-1		16098	26183.5	836.113		23697.3	14439		351.864	3672.76		135.519
22-004-TP1C-2		24460.6	15230.1	1324.08		26207.8	20149.5		623.08	7379.47		114.439
22-004-TP1C-3		16326.8	15983.4	900.814		20312	13873.9		260.902	2826.53		162.009
22-004-TP1C-4		29857.9	17665.2	1288.81		25427.5	20154.7		601.673	5984.5		122.863
22-004-TP1C-4-DUP		30616.1	17592.8	1363.65		25451.9	20393.4		593.464	5931.86		130.472
22-004-TP1D-1		18687.7	19884.6	878.901		19068.4	15226.7		290.364	4653.96		204.525
22-004-TP1D-2		22785.9	20534.4	1227.44		25112.2	26026.5		1708.37	10310.9		158.373
22-004-TP1D-3		15421.6	20491.6	1311.11		18589.2	25096.2		1654.85	10901.9		171.137
22-004-TP1D-4		20304.1	13773.9	1995.74		13323.2	27942.1		1309.71	12488.5		207.365
22-004-TP2-1		12936.7	21785.7	675.944		57783.4	14668.8		206.372 *	10194.3		51.6459
22-004-TP2-2		23816.7	20664.2	932.244		32871.9	15312.6		413.703	7152.7		90.0597
22-004-TP2-3		23258.5	9673.55	2665.44		8070.17	28652.4		184.966 *	1307.57	94.5078 *	400.461
22-004-TP-1-COMP		16142.7	19292.8	761.935		24096	15672.3		524.242	5961.46	732.406	126.672
22-004-TP-2-COMP		23193.1	14558.8	1539.69		19921.4	25010.3		1519.28	9908.13		180.883

	Zr	Hg	Mo	Pb	Rb	Cd	Sb	Ba	Ag	U	Th
22-004-TP1A-A	130.864			11177.8	243.566		251.636	374.966	187.697 *		21.7566 *
22-004-TP1A-B	236.418			469.575	164.614			678.771			12.4137 *
22-004-TP1B-1	106.165			4099.65	131.916		111.221 *	258.775			14.4208
22-004-TP1B-2	103.374			4820.3	132.048		76.1721 *	235.278			
22-004-TP1B-3	87.8297			4840.74	128.453		201.045	140.554	133.327 *		25.2504
22-004-TP1C-1	110.495			4951.88	150.066		85.2388 *	213.826	79.6166 *		
22-004-TP1C-2	112.614			7242.03	202.779		156.785 *	282.28	126.38 *		39.1464
22-004-TP1C-3	105.379			4670.55	153.802		116.572 *	295.652	145.914 *		29.5558
22-004-TP1C-4	131.559			8291.82	218.24		143.853 *	328.014	115.521 *		29.7078
22-004-TP1C-4-DUP	133.536			8267.97	228.353		171.692 *	325.041	109.3 *		
22-004-TP1D-1	109.05			4365.33	131.091		83.4143 *	278.408	98.3549 *		
22-004-TP1D-2	124.741			11210.8	168.517		339.118	323.345	199.062 *		31.8399
22-004-TP1D-3	105.871			11224	129.519	164.922 *	418.89	240.371	268.616 *		25.636
22-004-TP1D-4	149.3			9637.88	140.962		283.172	353.644	225.186 *		25.9208
22-004-TP2-1	118.653			6177.29	117.126		74.822 *	95.3112			
22-004-TP2-2	110.074			8056.32	182.589		113.057 *	180.333	161.828 *		24.3065
22-004-TP2-3	248.421			642.499	154.315			726.497		13.5875 *	20.3162
22-004-TP-1-COMP	118.23			4915.8	135.584		147.792 *	221.31	117.809 *		
22-004-TP-2-COMP	129.617			10278.3	154.549		269.244	296.696	210.514 *		33.8929

* - Estimated Quantity
$ - Unvalidated Data

ABANDONED AND INACTIVE MINES SCORING SYSTEM (AIMSS) SCORESHEET

CORBIN FLATS
PA NO. 22-004

AIMSS SCORESHEET

SITE NAME: CORBIN FLATS
PA NUMBER: 22-004

LINE NO.				
		GROUNDWATER PATHWAY		
1	GW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		0
2		EXCEEDENCES		0
3A		CONTAINMENT		20
3B		GW DEPTH		20
3C		POTENTIAL TO RELEASE	LINES 3A x 3B	400
4		LIKELIHOOD SCORE	LINES 1 + 2 + 3C	400
5	GW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4119.007
6	GW - TARGETS	WELLS - 1 MI. x 2.5		107.5
7		WELLS - 1 TO 4 MI		110
8		NEAREST WELL		5
9		TARGETS SCORE	LINES 6 + 7 + 8	222.5
10		**GROUNDWATER SCORE**	LINES 4 x 5 x 9	366591623
		SURFACE WATER PATHWAY		
11	SW - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		300
12		EXCEEDENCES		100
13A		CONTAINMENT		20
13B		DISTANCE TO SW		20
13C		POTENTIAL TO RELEASE	LINES 13A x 13B	400
14		LIKELIHOOD SCORE	LINES 11 + 12 + 13C	800
15	SW - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	4493.272
16	SW - TARGETS	DRINKING WATER POP'N		0
17		IMPACTED DRAINAGE		5
18		WETLANDS		10
19		FISHERY		5
20		RECREATION		5
21		IRRIGATION/STOCK		2
22		T & E SPECIES HABITAT		0
23		TARGETS SCORE	SUM LINES 16 - 22	27
24		**SURFACE WATER SCORE**	LINES 14 x 15 x 23	97054675
		AIR PATHWAY		
25	AIR - LIKELIHOOD OF RELEASE	OBSERVED RELEASE		200
26A		CONTAINMENT		20
26B		DISTANCE TO POPULATION		10
26C		POTENTIAL TO RELEASE	LINES 26A x 26B	200
27		LIKELIHOOD SCORE	LINES 25 + 26C	400
28	AIR - WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	90.787
29	AIR - TARGETS	POPULATION - 4 MILES		100
30		NEAREST RESIDENCE		5
31		WETLANDS		0
32		PARKS / WILDERNESS		0
33		T & E SPECIES HABITAT		0
34		TARGETS SCORE	SUM LINES 29 - 33	105
35		**AIR PATHWAY SCORE**	LINES 27 x 28 x 34	3813054
		DIRECT CONTACT PATHWAY		
36	LIKELIHOOD OF EXPOSURE	OBSERVED EXPOSURE		50
37A		ACCESSIBILITY		20
37B		DISTANCE TO POPULATION		10
37C		POTENTIAL EXPOSURE	LINES 37A x 37B	200
38		LIKELIHOOD SCORE	LINES 36 + 37C	250
39	D. C. WASTE CHAR.	CALCULATED SCORE	(SEE WORKSHEET)	83.471
40	DIRECT CONTACT TARGETS	POPULATION - 1 MILE		100
41		NEAREST RESIDENCE		5
42		RECREATIONAL USE		10
43		TARGETS SCORE	SUM LINES 40 - 42	115
44		**DIRECT CONTACT SCORE**	LINES 38 x 39 x 43	2399791
45	**TOTAL SITE HUMAN & ENVIRONMENTAL HAZARD SCORE** (LINES 10 + 24 + 35 + 44) / 100,000			**4698.59**

LINE NO.		SITE SAFETY	SITE NAME: PA NUMBER:	CORBIN FLATS 22-004
1	THREAT	ACCESSIBILITY		20
2		OPEN SHAFTS	100 EA.	0
3		OPEN ADITS	50 EA.	0
4	HAZARDS	UNSTAB. HIWALLS / PITS	75 EA.	75
5		HAZ. STRUCTURES	40 EA.	0
6		EXPLOSIVES		0
7		HAZ. MATERIALS		0
8		HAZARDS SCORE	SUM LINES 2 - 7	75
9		POPULATION - 1 MILE		100
10	TARGETS	NEAREST RESIDENCE		5
11		RECREATIONAL USE		10
12		TARGETS SCORE	SUM LINES 9 - 11	115
13		**SITE SAFETY SCORE**	(LINES 1 x 8 x 12) / 1,000	**172.50**

SUMMARY OF HISTORICAL ANALYTICAL DATA FROM OTHER SOURCES

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LTH DEPT.          WATER QUALITY BUREAU            HELENA, MONTANA  59601

STATE  MONTANA                                     COUNTY  JEFFERSON
LONG.  452252N 1115543W                   SAMPLE LOCATION   7N   3W   1CC
T CODE                                    ANALYSIS NUMBER  75W0646
AMPLED  05-12-75                           DRAINAGE BASIN   41I
AMPLED                                     WATER FLOW RATE     20.  CFS(E)
AMPLED  GRAB                     FLOW MEASUREMENT METHOD  NOT MEASURED
SOURCE  STREAM                   ALTITUDE OF LAND SURFACE
TER USE  UNUSED                 TOTAL WELL DEPTH BELOW LS
IFER(S)                          SWL ABOVE(+) OR BELOW LS
PLED BY  WQBH                   SAMPLE DEPTH BELOW SURFACE

 SAMPLING SITE: SPRING CK AT CORBIN MT

              MG/L      MEQ/L                                MG/L      MEQ/L
UM (CA)                            BICARBONATE(HCO3)
UM (MG)                              CARBONATE (CO3)
UM (NA)                               CHLORIDE   (CL)
UM  (K)                                SULFATE (SO4)
ON (FE)                               FLUORIDE    (F)
SE (MN)                            NITRATE (NO3 AS N)
UM (AL)                            NO3+NO2 (TOT AS N)
                                  PHOSPHATE(PO4 AS P)
                         ------                                   ------
    TOTAL CATIONS        0.0                      TOTAL ANIONS     0.000

        LABORATORY PH                  TOTAL HARDNESS AS CACO3
WATER TEMPERATURE (C)                TOTAL ALKALINITY AS CACO3
VED SOLIDS CALCULATED                      LAB TURBIDITY (JTU)  3200.
ONDUCTIVITY-UMHOS-25C                  SODIUM ADSORPTION RATIO

               A D D I T I O N A L   P A R A M E T E R S
ENT,TOT,SUSP (MG/L) 11830.      CNDUCTVY,FIELD MICROMHOS  1050.
RON,TR (MG/L AS FE)    71.        COPPER,TR (MG/L AS CU)    14.
INC,TR (MG/L AS ZN)    60.      MANGANESE,TR(MG/L AS MN)    53.
EAD,TR (MG/L AS PB)    2.2      CADMIUM, TR (MG/L AS CD)      .238
NIC,TR (MG/L AS AS)     .350




KS: SPRING CK SURVEILLANCE    Flooding

ATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
NSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
E NO        2  SAMPLER  MJP    HANDLING 1100   ANALYST   KK   LAB  WQBH
TED 10-03-75  COMPUTER RUN 10/06/75  PROGRAM  SYS 75    FUND 0650
DEV. ION BALANCE  0.00      CA    MG    NA     K    CL   SO4  HCO3  CO3  NO3
T      MPDES                0.0   0.0   0.0   0.0 33.3  33.3  0.0 33.3 0.0
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DEPT.          WATER QUALITY BUREAU          HELENA, MONTANA  59601

 MONTANA                                      COUNTY  JEFFERSON
 462315N 112 132W              SAMPLE LOCATION  7N  3W  6ACC
DE                             ANALYSIS NUMBER  75W0645
ED  05-12-75                    DRAINAGE BASIN   41I
ED                              WATER FLOW RATE       20.  CFS(E)
ED  GRAB              FLOW MEASUREMENT METHOD  NOT MEASURED
CE  STREAM            ALTITUDE OF LAND SURFACE
USE  UNUSED           TOTAL WELL DEPTH BELOW LS
(S)                      SWL ABOVE(+) OR BELOW LS
BY  WQBH               SAMPLE DEPTH BELOW SURFACE

PLING SITE: SPRING CK AT JEFFERSON CITY MT

          MG/L     MEQ/L                                   MG/L     MEQ/L
(CA)                         BICARBONATE(HCO3)
(MG)                           CARBONATE (CO3)
(NA)                            CHLORIDE  (CL)
(K)                              SULFATE (SO4)
(FE)                            FLUORIDE    (F)
(MN)                        NITRATE (NO3 AS N)
(AL)                        NO3+NO2 (TOT AS N)
                           PHOSPHATE(PO4 AS P)
                  ------                                            ------
 TOTAL CATIONS     0.0                         TOTAL ANIONS          0.000

   LABORATORY PH                     TOTAL HARDNESS AS CACO3
R TEMPERATURE (C)                   TOTAL ALKALINITY AS CACO3
SOLIDS CALCULATED                      LAB TURBIDITY (JTU)   2500.
CTIVITY-UMHOS-25C                    SODIUM ADSORPTION RATIO

         A D D I T I O N A L   P A R A M E T E R S
,TOT,SUSP (MG/L)  7830.       CNDUCTVY,FIELD MICROMHOS  9500.
,TR (MG/L AS FE)    76.         COPPER,TR (MG/L AS CU)     8.0
,TR (MG/L AS ZN)   112.       MANGANESE,TR(MG/L AS MN)   160.
,TR (MG/L AS PB)    25.       CADMIUM, TR (MG/L AS CD)     .376
,TR (MG/L AS AS)   < 0.001




 SPRING CK SURVEILLANCE   Flooding

ION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
TITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
SURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
G        1  SAMPLER  MJP    HANDLING 1100    ANALYST   ME   LAB  WQBH
D 09-03-75  COMPUTER RUN 09/05/75  PROGRAM  SYS 75     FUND 0650
. ION BALANCE  0.00      CA   MG   NA    K   CL  SO4  HCO3  CO3  NO3
   MPOES                0.0  0.0  0.0  0.0 33.3 33.3  0.0 33.3  0.0
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EALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

  STATE   MONTANA                                  COUNTY  JEFFERSON
-LONG.   462235N 112 343W                SAMPLE LOCATION   7N  4W 11AAC
ON CODE                                  ANALYSIS NUMBER  77W1082
SAMPLED  06-07-77                         DRAINAGE BASIN  041I -U MISSOURI
SAMPLED  1315                            WATER FLOW RATE        5.27CFS(M)
SAMPLED  GRAB                    FLOW MEASUREMENT METHOD  GURLEY METER
 SOURCE  STREAM                 ALTITUDE OF LAND SURFACE
ER USE   MULTIPLE              TOTAL WELL DEPTH BELOW LS
IFER(S)                          SWL ABOVE(+) OR BELOW LS
PLED BY  WQBH                 SAMPLE DEPTH BELOW SURFACE

  SAMPLING SITE: SPRING CK AT BRIDGE SOUTH OF CORBIN upstr. Corbin Creek

               MG/L      MEQ/L                               MG/L      MEQ/L
UM (CA)                              BICARBONATE(HCO3)
UM (MG)                                CARBONATE (CO3)
UM (NA)                                 CHLORIDE  (CL)
UM  (K)                                  SULFATE (SO4)    137.         2.852
ON (FE)                                 FLUORIDE   (F)
SE (MN)                           PHOSPHATE(PO4 AS P)
UM (AL)                            NO3+NO2(TOT AS N)

              ______     ______                         ______      ______
CATIONS         0.0        0.0              SUM ANIONS  137.000      2.852

       LABORATORY PH       7.80     TOT HARDNESS(MG/L-CACO3)
ATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
SS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (JTU)
NDUCTIVITY-UMHOS-25C   388.0          SODIUM ADSORPTION RATIO

           A D D I T I O N A L   P A R A M E T E R S
AD,TR (MG/L AS PB)    < 0.05         IRON,TR (MG/L AS FE)          .16
M, TR (MG/L AS CD)    < 0.005      COPPER,TR (MG/L AS CU)          .01
NC,TR (MG/L AS ZN)      .04      MANGANESE,TR(MG/L AS MN)          .03
IC,TR (MG/L AS AS)      .019      SILVER, TR (MG/L AS AG)       < 0.01



= BOULDER BATHOLITH 0662

TION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
STITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
ASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
NO 07      SAMPLER   DP     HANDLING 3201    ANALYST  KEV    LAB  WQBH
ED 07-31-77  COMPUTER RUN 08/29/77  DATA 0975/PROG 0876 FUND 0663
V. ION BALANCE  9.99      CA   MG   NA    K    CL  SO4  HCO3  CO3  NO3
     MPDES                0.0  0.0  0.0  0.0  0.0100.0  0.0  0.0  0.0
EQ/L= INSUFFICIENT DATA                                       77W1082
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STATE HEALTH DEPT.          WATER QUALITY BUREAU             HELENA, MONTANA  59601

         STATE   MONTANA                                   COUNTY  JEFFERSON
    LAT.-LONG.   462248N 112 447W                  SAMPLE LOCATION   7N  4W  3000
  STATION CODE.                                    ANALYSIS NUMBER   77W1102
  DATE SAMPLED   06-09-77                           DRAINAGE BASIN   0411 -U MISS
  TIME SAMPLED   1200                               WATER FLOW RATE
METHOD SAMPLED   GRAB                       FLOW MEASUREMENT METHOD
 SAMPLE SOURCE   MINE DRAIN                ALTITUDE OF LAND SURFACE
     WATER USE   UNUSED                   TOTAL WELL DEPTH BELOW LS
    AQUIFER(S)                            SWL ABOVE(+) OR BELOW LS
    SAMPLED BY   WQBH                   SAMPLE DEPTH BELOW SURFACE

      SAMPLING SITE: WATER JUST BELCW TAILINGS ABOVE CORB

                      MG/L      MEQ/L                                       MG
   CALCIUM (CA)                              BICARBONATE(HCO3)
 MAGNESIUM (MG)                                CARBONATE (CO3)
    SODIUM (NA)                                 CHLORIDE   (CL)
 POTASSIUM   (K)                                 SULFATE (SO4)   215.           4.476
      IRON (FE)                                 FLUORIDE    (F)
 MANGANESE (MN)                            PHOSPHATE(PO4 AS P)
  ALUMINUM (AL)                             NO3+NO2(TOT AS N)

                     -----     -----                             -------      -----
   SUM CATIONS        0.0       0.0                 SUM ANIONS   215.000      4.476

              LABORATORY PH        7.50    TOT HARDNESS(MG/L-CACO3)
 FIELD WATER TEMPERATURE (C)              TOT ALKALINITY(MG/L-CACO3)
 SUM-DISS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (JTU)
 LAB CONDUCTIVITY-UMHOS-25C    712.1        SODIUM ADSORPTION RATIO

                 A D D I T I O N A L   P A R A M E T E R S
       LEAD,TR (MG/L AS PB)   < 0.05          IRON,TR (MG/L AS FE)         .89
   CADMIUM, TR (MG/L AS CD)      .018       COPPER,TR (MG/L AS CU)         .46
       ZINC,TR (MG/L AS ZN)     1.4       MANGANESE,TR(MG/L AS MN)         .59
    ARSENIC,TR (MG/L AS AS)      .001      SILVER, TR (MG/L AS AG)    < 0.01
   MERCURY, TR (MG/L AS HG)   < 0.0002

 REMARKS: BOULDER BATHOLITH            HEADWATERS OF UNNAMED CK ABOVE CORBI

 EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 SAMPLE NO 05        SAMPLER   DP     HANDLING 2100    ANALYST  LAB    LAB  WQBH
 COMPLETED 09-16-77  COMPUTER RUN 09/27/77  DATA 0975/PROG 0876 FUND 0662
 STND DEV. ION BALANCE  9.99        CA    MG    NA     K    CL   SO4  HCO3   CO3   NO3
 SEGMENT         MPDES             0.0   0.0   0.0   0.0   0.0100.0   0.0   0.0   0.0
 CALC. MEQ/L= INSUFFICIENT DATA                                                 77W110
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Permits relate to

Unn. Check

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STATE HEALTH DEPT.          WATER QUALITY BUREAU          HELENA, MONTANA  59601

          STATE  MONTANA                                  COUNTY  JEFFERSON
     LAT.-LONG.  462248N 112 221W               SAMPLE LOCATION  7N  4W  1000
   STATION CODE                                 ANALYSIS NUMBER  77W1101
   DATE SAMPLED  06-09-77                        DRAINAGE BASIN  0411 -U MISSOURI
   TIME SAMPLED  1130                           WATER FLOW RATE       .37CFS(M)
 METHOD SAMPLED  GRAB                   FLOW MEASUREMENT METHOD  GURLEY METER
  SAMPLE SOURCE  STREAM                ALTITUDE OF LAND SURFACE
      WATER USE  UNKNOWN              TOTAL WELL DEPTH BELOW LS
     AQUIFER(S)                        SWL ABOVE(+) OR BELOW LS
     SAMPLED BY  WQBH                SAMPLE DEPTH BELOW SURFACE

          SAMPLING SITE: UNNAMED CK FLOWING THROUGH CORBIN

                      MG/L       MEQ/L                             MG/L      MEQ/L
   CALCIUM (CA)                          BICARBONATE(HCO3)
 MAGNESIUM (MG)                            CARBONATE (CO3)
    SODIUM (NA)                             CHLORIDE  (CL)
 POTASSIUM  (K)                              SULFATE (SO4)  1210.          25.192
      IRON (FE)                             FLUORIDE   (F)
 MANGANESE (MN)                        PHOSPHATE(PO4 AS P)
  ALUMINUM (AL)                          NO3+NO2(TOT AS N)
  HYDROGEN (H+)        1.27      1.259

                     ------    ------                      --------   ------
     SUM CATIONS       1.269     1.259            SUM ANIONS  1210.000   25.192

                  LABORATORY PH       2.90    TOT HARDNESS(MG/L-CACO3)
 FIELD WATER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)
  SUM-DISS. IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (JTU)
  LAB CONDUCTIVITY-UMHOS-25C  2355.7            SODIUM ADSORPTION RATIO

                    A D D I T I O N A L   P A R A M E T E R S
      LEAD,TR (MG/L AS PB)   < 0.05        IRON,TR (MG/L AS FE)     50.
  CADMIUM, TR (MG/L AS CD)      .30       COPPER,TR (MG/L AS CU)     3.0
      ZINC,TR (MG/L AS ZN)   115.       MANGANESE,TR(MG/L AS MN)   155.
   ARSENIC,TR (MG/L AS AS)      .025     SILVER, TR (MG/L AS AG)   < 0.01
  MERCURY, TR (MG/L AS HG)      .0005

 REMARKS: BOULDER BATHOLITH 0662     NO PERIPHYTON SAMPLE

 EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 (M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 SAMPLE NO 04        SAMPLER   DP    HANDLING 2100   ANALYST  LAB   LAB  WQ
 COMPLETED 09-16-77  COMPUTER RUN 09/27/77  DATA 0975/PROG 0876 FUND 0662
 STND DEV. ION BALANCE  9.99      CA    MG    NA     K    CL  SO4  HCO3  CO3  NO3
 SEGMENT        MPDES             0.0   0.0   0.0   0.0   0.0100.0  0.0   0.0  0.0
 CALC. MEQ/L= INSUFFICIENT DATA                                          77W1101
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                 WATER QUALITY BUREAU          HELENA, MONTANA  59601

                                            COUNTY  JEFFERSON
    MONTANA
    462521N 112 132W              SAMPLE LOCATION   7N   3W   6ACE
                                 ANALYSIS NUMBER   77W1098
                                  DRAINAGE BASIN   041I -U MISSOURI
ED) 06-09-77                      WATER FLOW RATE       2.88CFS(M)
ED) 1015                FLOW MEASUREMENT METHOD    GURLEY METER
ED) GRAB                ALTITUDE OF LAND SURFACE
CE) STREAM              TOTAL WELL DEPTH BELOW LS
SE  MULTIPLE              SWL ABOVE(+) OR BELOW LS
S)                      SAMPLE DEPTH BELOW SURFACE
BY  WQBH

MPLING SITE: SPRING CREEK AT JEFFERSON CITY

          MG/L      MEQ/L                                 MG/L       MEQ/L
                              BICARBONATE(HCO3)
 CA)                           CARBONATE (CO3)
 MG)                            CHLORIDE   (CL)
 NA)                             SULFATE (SO4)    158.           3.290
 (K)                            FLUORIDE    (F)
 FE)                        PHOSPHATE(PO4 AS P)
 MN)                          NO3+NO2(TOT AS N)
 AL)


          -------     -------                         ----------   -------
T IONS      0.0         0.0              SUM ANIONS   158.000        3.290

    LABORATORY PH         7.10      TOT HARDNESS(MG/L-CACO3)
ER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)
  IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (JTU)
UCTIVITY-UMHOS-25C    484.8          SODIUM ADSORPTION RATIO

         A D D I T I O N A L    P A R A M E T E R S
,TR (MG/L AS PB)     < 0.05          IRON,TR (MG/L AS FE)      2.4
 TR (MG/L AS CD)       .013        COPPER,TR (MG/L AS CU)       .13
,TR (MG/L AS ZN)      5.4        MANGANESE,TR(MG/L AS MN)      8.0
,TR (MG/L AS AS)       .017       SILVER, TR (MG/L AS AG)    < 0.01
 TR (MG/L AS HG)       .0002




 BOULDER BATHOLITH 0662

ION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
STITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
ASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
NO 01        SAMPLER   DP    HANDLING 3201    ANALYST  LAB    LAB  WQBH
ED 09-16-77  COMPUTER RUN 09/27/77  DATA 0975/PROG 0876 FUND 0662
V. ION BALANCE  9.99       CA   MG    NA    K    CL   SO4   HCO3  CO3   NO3
     MPDES                 0.0  0.0   0.0   0.0  0.0100.0   0.0   0.0   0.0
EQ/L= INSUFFICIENT DATA                                          77W1098
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                   WATER QUALITY BUREAU          HELENA, MONTANA  59601
EPT.
                                             COUNTY  JEFFERSON
MONTANA
462255N 112 316W                    SAMPLE LOCATION   7N   4W   10CA
                                   ANALYSIS NUMBER  77W1099
DE                                  DRAINAGE BASIN  041I -U MISSOURI
ED  06-09-77
ED  1045                            WATER FLOW RATE         2.51CFS(M)
ED  GRAB                   FLOW MEASUREMENT METHOD  GURLEY METER
CE  STREAM                 ALTITUDE OF LAND SURFACE
USE  MULTIPLE              TOTAL WELL DEPTH BELOW LS
(S)                          SWL ABOVE(+) OR BELOW LS
 BY  WQBH                 SAMPLE DEPTH BELOW SURFACE

MPLING SITE:  SPRING CREEK JUST BELOW CORBIN

          MG/L       MEQ/L                          MG/L       MEQ/L
                             BICARBONATE(HCO3)
(CA)                           CARBONATE (CO3)
(MG)                            CHLORIDE   (CL)
(NA)                             SULFATE (SO4)   153.          3.185
 (K)                            FLUORIDE    (F)
(FE)                        PHOSPHATE(PO4 AS P)
(MN)                         NO3+NO2(TOT AS N)
(AL)

ATIONS      0.0        0.0              SUM ANIONS   153.000      3.185

      LABORATORY PH      7.00      TOT HARDNESS(MG/L-CACO3)
ER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (JTU)
UCTIVITY-UMHOS-25C   476.2         SODIUM ADSORPTION RATIO

         A D D I T I O N A L   P A R A M E T E R S
,TR (MG/L AS PB)    < 0.05         IRON,TR (MG/L AS FE)        2.7
 TR (MG/L AS CD)        .013     COPPER,TR (MG/L AS CU)         .14
,TR (MG/L AS ZN)     5.5       MANGANESE,TR(MG/L AS MN)        7.8
,TR (MG/L AS AS)        .010      SILVER, TR (MG/L AS AG)   < 0.01
 TR (MG/L AS HG)    < 0.0002

 BOULDER BATHOLITH 0662

TION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
NSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
EASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
NO 02        SAMPLER   DP    HANDLING 3201   ANALYST  LAB   LAB  WQBH
ED 09-16-77  COMPUTER RUN 09/27/77  DATA 0975/PROG 0876 FUND 0662
EV. ION BALANCE  9.99       CA    MG    NA     K    CL   SO4  HCO3  CO3  NO3
T      MPDES                0.0   0.0   0.0   0.0   0.0100.0   0.0  0.0  0.0
MEQ/L= INSUFFICIENT DATA                                              77W1099
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ATE HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

      STATE  MONTANA
  LAT.-LONG.  462242N 112 334W                          COUNTY  JEFFERSON
STATION CODE                              SAMPLE LOCATION  7N  4W 11AAA
DATE SAMPLED  03-29-78                    ANALYSIS NUMBER  78W0368
TIME SAMPLED                               DRAINAGE BASIN  0411 -U MISSOURI
THOD SAMPLED  GRAB                         WATER FLOW RATE        .5 CFS(E)
AMPLE SOURCE  MINE DRAIN             FLOW MEASUREMENT METHOD
   WATER USE  UNUSED                ALTITUDE OF LAND SURFACE
  AQUIFER(S)                       TOTAL WELL DEPTH BELOW LS
  SAMPLED BY  WQBH                   SWL ABOVE(+) OR BELOW LS
                                   SAMPLE DEPTH BELOW SURFACE

     SAMPLING SITE: WATER FROM ALTA MOUNTAIN

              MG/L      MEQ/L
ALCIUM (CA)                                                 MG/L      MEQ/L
NESIUM (MG)                       BICARBONATE(HCO3)
SODIUM (NA)                         CARBONATE (CO3)
ASSIUM  (K)                         CHLORIDE   (CL)    6316.8
                                     SULFATE (SO4)   *******      65.833
                                    FLUORIDE    (F)
                                 PHOSPHATE(PO4 AS P)
                                 NO3+NO2 (TOT AS N)
DROGEN (H+)     2.01      1.995

 SUM CATIONS    2.011     1.995         SUM ANIONS  3162.000     65.833

          LABORATORY PH         2.70     TOT HARDNESS(MG/L-CACO3)
LD WATER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)
M-DISS. IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (NTU)
B CONDUCTIVITY-UMHOS-25C  3970.0          SODIUM ADSORPTION RATIO

             A D D I T I O N A L   P A R A M E T E R S
RSENIC,TR (MG/L AS AS)      2.2     CADMIUM, TR (MG/L AS CD)       .924
COPPER,TR (MG/L AS CU)     16.             ZINC,TR (MG/L AS ZN)   266.
  IRON,TR (MG/L AS FE)    334.      MANGANESE,TR(MG/L AS MN)   333.
UCTVY,FIELD MICROMHOS   2987.

RKS:  MINE DRAINAGE 0650

ANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
LE NO             SAMPLER   OP    HANDLING 2100    ANALYST  WRK   LAB  WQBH
LETED 04-18-78  COMPUTER RUN 04/19/78  DATA 0975/PROG 0876 FUND 0650
 DEV. ION BALANCE  9.99      CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
ENT     MPDES               0.0   0.0   0.0   0.0  0.0100.0  0.0   0.0  0.0
 MEQ/L= INSUFFICIENT DATA
                                                                   78W0368
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ALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  596

STATE   MONTANA                                  COUNTY  JEFFERSON
LONG.   462248N 112 325W               SAMPLE LOCATION   7N  4W  1CCC
CODE                                   ANALYSIS NUMBER  78W0369
MPLED   03-29-78                        DRAINAGE BASIN  0411 -U MISSOURI
SAMPLED                                 WATER FLOW RATE       1.0 CFS(E)
SAMPLED  GRAB                     FLOW MEASUREMENT METHOD
SOURCE  STREAM                   ALTITUDE OF LAND SURFACE
TER USE  UNUSED                  TOTAL WELL DEPTH BELOW LS
UIFER(S)                          SWL ABOVE(+) OR BELOW LS
SAMPLED BY  WQBH               SAMPLE DEPTH BELOW SURFACE

   SAMPLING SITE: UNNAMED CREEK AT CORBIN

             MG/L      MEQ/L                              MG/L      MEQ/L
LCIUM (CA)                          BICARBONATE(HCO3)
ESIUM (MG)                            CARBONATE (CO3)
ODIUM (NA)                             CHLORIDE  (CL)
SSIUM  (K)                              SULFATE (SO4)   882.000    18.363
                                       FLUORIDE   (F)
                                  PHOSPHATE(PO4 AS P)
                                   NO3+NO2 (TOT AS N)
ROGEN (H+)      0.80       0.794
                -------   -------                      -------   -------
SUM CATIONS     0.801      0.794           SUM ANIONS  882.000    18.363

        LABORATORY PH        3.10     TOT HARDNESS(MG/L-CACO3)
 WATER TEMPERATURE (C)       16.0    TOT ALKALINITY(MG/L-CACO3)
-DISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
CONDUCTIVITY-UMHOS-25C  1834.0        SODIUM ADSORPTION RATIO

           ADDITIONAL  PARAMETERS
SENIC,TR (MG/L AS AS)      .374    CADMIUM, TR (MG/L AS CD)      .287
OPPER,TR (MG/L AS CU)     6.2         ZINC,TR (MG/L AS ZN)     75.2
 IRON,TR (MG/L AS FE)   118.       MANGANESE,TR(MG/L AS MN)    98.5
UCTVY,FIELD MICROMHOS  1000.




RKS:  MINE DRAINAGE 0650

ANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
LE NO            SAMPLER   OP    HANDLING 2100   ANALYST  WRK   LAB  WQBH
LETED 04-18-78  COMPUTER RUN 04/19/78  DATA 0979/PROG 0876 FUND 0650
 DEV. ION BALANCE  9.99     CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
ENT      NPDES              0.0   0.0   0.0   0.0  0.0100.0   0.0   0.0  0.0
. MEQ/L= INSUFFICIENT DATA                                       78W0369
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TH DEPT.          WATER QUALITY BUREAU              HELENA, MONTANA  59601

STATE  MONTANA                                  COUNTY  JEFFERSON
LONG.  462248N 112 325W                SAMPLE LOCATION   7N   4W   1CCC
CODE                                   ANALYSIS NUMBER   78W0367
PLED   03-29-78                         DRAINAGE BASIN   0411 -U MISSOURI
PLED                                   WATER FLOW RATE        1.0 CFS(E)
PLED   GRAB                   FLOW MEASUREMENT METHOD
OURCE  STREAM                ALTITUDE OF LAND SURFACE
R USE  MULTIPLE             TOTAL WELL DEPTH BELOW LS
FER(S)                       SWL ABOVE(+) OR BELOW LS
ED BY  WQBH                SAMPLE DEPTH BELOW SURFACE

SAMPLING SITE: SPRING CREEK AT CORBIN upstr. Corbin Creek

              MG/L       MEQ/L                             MG/L       MEQ/L
 (CA)                              BICARBONATE(HCO3)
 (MG)                                CARBONATE (CO3)
 (NA)                                 CHLORIDE  (CL)
 (K)                                   SULFATE (SO4)    115.000      2.394
                                      FLUORIDE   (F)
                                PHOSPHATE(PO4 AS P)
                                NO3+NO2 (TOT AS N)

                ------     ------                         -------     -----
CATIONS          0.0        0.0            SUM ANIONS    115.000      2.394

         LABORATORY PH         8.20     TOT HARDNESS(MG/L-CACO3)
ATER TEMPERATURE (C)           16.0    TOT ALKALINITY(MG/L-CACO3)
SS. IONS MEAS.(MG/L)                   LABORATORY TURBIDITY (NTU)
NDUCTIVITY-UMHOS-25C          384.0      SODIUM ADSORPTION RATIO

              A D D I T I O N A L   P A R A M E T E R S
IC,TR (MG/L AS AS)            .023     CADMIUM, TR (MG/L AS CD)     < .001
PER,TR (MG/L AS CU)         < .01         ZINC,TR (MG/L AS ZN)        .12
RON,TR (MG/L AS FE)           .39      MANGANESE,TR(MG/L AS MN)       .09
VY,FIELD MICROMHOS        230.

KS:  MINE DRAINAGE 0650

NATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
EASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
E NO              SAMPLER     OP     HANDLING 2100     ANALYST  ROB    LAB  WQBH
ETED 04-18-78  COMPUTER RUN 04/19/78  DATA C975/PROG C876 FUND 0650
DEV. ION BALANCE  9.99         CA   MG   NA    K    CL   SO4  HCO3  CO3  NO3
NT       MPDES                 0.0  0.0  0.0  0.0  0.0100.0  0.0  0.0  0.0
MEQ/L= INSUFFICIENT DATA                                            78W0367
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     WATER QUALITY BUREAU                 HELENA, MONTANA  59601

                                         COUNTY  JEFFERSON
                              SAMPLE LOCATION     7N   3W   6ACA
   112 123W                   ANALYSIS NUMBER   79W0319
                               DRAINAGE BASIN   C411 -U MISSOURI
                              WATER FLOW RATE        3.2 CFS(M)
                    FLOW MEASUREMENT METHOD     FLOW METER
                   ALTITUDE OF LAND SURFACE
     AN            TOTAL WELL DEPTH BELOW LS
    USED            SWL ABOVE(+) OR BELOW LS
                  SAMPLE DEPTH BELOW SURFACE
     BH

  SITE: SPRING CREEK NEAR MOUTH

                                                 MG/L          MEQ/L
      MG/L      MEQ/L
      58.2       2.904   BICARBONATE(HCO3)       63.4           1.040
      10.6       0.872     CARBONATE (CO3)        0.0           0.0
      10.6       0.461       CHLORIDE  (CL)       1.8           0.051
       2.2       0.056        SULFATE (SO4)     159.0           3.310
                              FLUORIDE   (F)      0.16          0.008
                     PHOSPHATE(PO4 AS P)        < .01
                       NO3+NO2 (TOT AS N)         0.37          0.026

          -------    -------                    -------        ------
 IONS     81.6       4.294         SUM ANIONS   224.8           4.436

    LABORATORY PH        7.33    TOT HARDNESS(MG/L-CACO3)     189
 R TEMPERATURE (C)       4.0    TOT ALKALINITY(MG/L-CACO3)     52
 IONS MEAS.(MG/L)      306.4   LABORATORY TURBIDITY (NTU)     14.0
 TIVITY-UMHOS-25C      452.3     SODIUM ADSORPTION RATIO       0.3

     A D D I T I O N A L   P A R A M E T E R S
 TOT,SUSP (MG/L)      30.3     ARSENIC,TR (MG/L AS AS)      .021
 TR (MG/L AS CU)       .08         LEAD,TR (MG/L AS PB)      .20
 TR (MG/L AS ZN)      2.2      PHOSPHOROUS,TOT (MG/L-P)      .03
 TR (MG/L AS HG)    < .0002         IRON,TR (MG/L AS FE)    1.8
 ,TR(MG/L AS MN)      3.3                   PH,FIELD(SU)    7.75
 FIELD MICROMHOS    310.      AMMONIA,TOTAL(MG/L AS N)   < 0.01
 ,KJL,TOT(MG/L-N)      .14




  PRICKLY PEAR STUDY

 ON: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 ITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
 SURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 0 02        SAMPLER  ROB     HANDLING 4200    ANALYST  JAH   LAB  WQBH
 0 04-24-79  COMPUTER RUN 05/03/79  DATA 0975/PROG 0876 FUND 6053
   ION BALANCE  0.90        CA    MG    NA     K    CL   SO4  HCO3  CO3  NO3
     MPDES                 67.6  20.3  10.7   1.3   1.2  75.2  23.6  0.0  0.0
 Q/L=     4.338 TO        4.795                                     79W0319
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ALTH DEPT.          WATER QUALITY BUREAU          HELENA, MONTANA  59601

STATE  MONTANA                                     COUNTY  JEFFERSON
LONG.  462321N 112 123W                  SAMPLE LOCATION   7N  3W  6ACA
N CODE                                   ANALYSIS NUMBER  79W1095
AMPLED  06-12-79                          DRAINAGE BASIN  0411 -U MISSOURI
AMPLED  1200                              WATER FLOW RATE       3.7 CFS(M)
AMPLED  GRAB                      FLOW MEASUREMENT METHOD  GURLEY METER
SOURCE  STREAM                      ALTITUDE OF LAND SURFACE
TER USE  MULTIPLE                 TOTAL WELL DEPTH BELOW LS
IFER(S)                             SWL ABOVE(+) OR BELOW LS
PLED BY  WQBH                     SAMPLE DEPTH BELOW SURFACE

 SAMPLING SITE: SPRING CR NEAR MOUTH

            MG/L       MEQ/L                             MG/L       MEQ/L
UM (CA)     76.7       3.827   BICARBONATE(HCO3)         62.6       1.026
UM (MG)     13.8       1.135     CARBONATE  (CO3)         0.0       0.0
UM (NA)     11.3       0.492      CHLORIDE   (CL)         2.0       0.056
UM  (K)                            SULFATE (SO4)        216.0       4.497
                                  FLUORIDE    (F)
                           PHOSPHATE(PO4 AS P)          0.014      0.001
                             NO3+NO2 (TOT AS N)          0.29       0.021

            -----      -----                            -----      -----
 CATIONS    101.8      5.454          SUM ANIONS        280.9      5.601

       LABORATORY PH          7.85    TOT HARDNESS(MG/L-CACO3)    248
ATER TEMPERATURE (C)         17.0   TOT ALKALINITY(MG/L-CACO3)    51
SS. IONS MEAS.(MG/L)        382.7   LABORATORY TURBIDITY (NTU)    18.
NDUCTIVITY-UMHOS-25C        532.0      SODIUM ADSORPTION RATIO     0.3

          A D D I T I O N A L   P A R A M E T E R S
NT.TOT.SUSP (MG/L)           6.1         ARSENIC.TR (MG/L AS AS)     .014
ER.TR (MG/L AS CU)           .22           LEAD.TR (MG/L AS PB)     .060
NC.TR (MG/L AS ZN)           4.5     PHOSPHOROUS.TOT (MG/L-P)       .02
Y. TR (MG/L AS HG)       < .0002           IRON.TR (MG/L AS FE)     2.8
ESE.TR(MG/L AS MN)           5.2                  PH.FIELD(SU)      7.9
A.TOTAL(MG/L AS N)           .02     NITROGEN.KJL.TOT(MG/L-N)       .10




S: PRICKLY PEAR STUDY

ATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
NSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
EASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 NO 02        SAMPLER  RDB   HANDLING 6402   ANALYST  JAH   LAB  WQBH
TED 07-03-79  COMPUTER RUN 07/18/79  DATA 0979/PROG 0876 FUND 6053
EV. ION BALANCE  0.84          CA   MG   NA    K   CL  SO4  HCO3  CO3  NO3
T      MPOES                 70.2 20.8  9.0  0.0  1.0 80.6 18.4  0.0  0.0
MEQ/L=      5.198 TO        5.745                                 79W1095
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DEPT.        WATER QUALITY BUREAU        HELENA, MONTANA  59601

STATE   MONTANA                                 COUNTY   JEFFERSON
LONG.   462321N 112 123W               SAMPLE LOCATION    7N   3W   6ACA
CODE                                   ANALYSIS NUMBER   79W1958
MPLED   08-23-79                        DRAINAGE BASIN   0411 -U MISSOURI
MPLED   1200                           WATER FLOW RATE       3.62CFS(M)
MPLED   GRAB                  FLOW MEASUREMENT METHOD   FLOW METER
SOURCE  STREAM                 ALTITUDE OF LAND SURFACE
ER USE  MULTIPLE              TOTAL WELL DEPTH BELOW LS
FER(S)                         SWL ABOVE(+) OR BELOW LS
LED BY  WQBH                 SAMPLE DEPTH BELOW SURFACE

-SAMPLING SITE: SPRING CR NR MOUTH

             MG/L      MEQ/L                               MG/L      MEQ/L
UM (CA)      67.3      3.358    BICARBONATE(HCO3)          58.6      0.960
UM (MG)      11.3      0.930      CARBONATE (CO3)           0.0      0.0
UM (NA)      11.1      0.483       CHLORIDE  (CL)           2.0      0.056
UM  (K)                             SULFATE (SO4)         189.0      3.935
                                   FLUORIDE   (F)
                              PHOSPHATE(PC4 AS P)         0.034      0.003
                               NO3+NO2 (TOT AS N)         0.44       0.031

 CATIONS     89.7      4.771           SUM ANIONS         250.0      4.986

        LABORATORY PH       7.32     TOT HARDNESS(MG/L-CACO3)     215
ATER TEMPERATURE (C)       14.5    TOT ALKALINITY(MG/L-CACO3)     48
SS. IONS MEAS.(MG/L)      339.7    LABORATORY TURBIDITY (NTU)     10.0
NDUCTIVITY-UMHOS-25C      513.0       SODIUM ADSORPTION RATIO      0.3

           ADDITIONAL  PARAMETERS
ENT,TOT,SUSP (MG/L)      94.3      ARSENIC,TR (MG/L AS AS)      .048
UM, TR (MG/L AS CD)      .010       COPPER,TR (MG/L AS CU)      .22
EAD,TR (MG/L AS PB)      .25          ZINC,TR (MG/L AS ZN)     3.3
HORCUS,TOT (MG/L-P)      .05          IRON,TR (MG/L AS FE)     4.4
NESE,TR(MG/L AS MN)      .42                   PH,FIELD(SU)    8.0
IA,TOTAL(MG/L AS N)    < 0.01     NITROGEN,KJL,TCT(MG/L-N)      .36

S:  PRICKLY PEAR STUDY

NATICN: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
NSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
E NO 02        SAMPLER  ROB    HANDLING 4200    ANALYST  JAH    LAB  WQBH
ETED 10-23-79  COMPUTER RUN 11/05/79  DATA 0975/PROG 0876 FUND 6053
DEV. ION BALANCE  1.30      CA    MG    NA     K    CL   SO4  HCO3  CO3  NO3
NT       MPDES             70.4  19.5  10.1   0.0  1.1  79.5  19.4  0.0  0.0
MEQ/L=      4.992 TO       5.517                                   79W1958
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ALTH DEPT.          WATER QUALITY BUREAU           HELENA, MONTANA   59601

 STATE   MONTANA                                  COUNTY   JEFFERSON
-LONG.   462310N 112 253W                SAMPLE LOCATION    7N   4W   1
N CODE                                   ANALYSIS NUMBER   79W2298
AMPLED   09-17-79                         DRAINAGE BASIN   -0411 -U MISSOURI
AMPLED                                   WATER FLOW RATE       90.  GPM(E)
AMPLED   GRAB                  FLOW MEASUREMENT METHOD   FLOAT + TIME
SOURCE   STREAM               ALTITUDE OF LAND SURFACE
ER USE   STOCK               TOTAL WELL DEPTH BELOW LS
FER(S)                        SWL ABOVE(+) OR BELOW LS
LED BY    DSL               SAMPLE DEPTH BELOW SURFACE

 SAMPLING SITE: SPRING CREEK ABOVE JEFF CITY

             MG/L      MEQ/L                                     MG/L      MEQ/L
UM (CA)                            BICARBONATE(HCO3)
UM (MG)                              CARBONATE (CO3)
UM (NA)                               CHLORIDE   (CL)
UM  (K)                                SULFATE (SO4)
                                      FLUORIDE    (F)
                                PHOSPHATE(PO4 AS P)
                                 NO3+NO2 (TOT AS N)

                ------    ------                         ------     ------
CATIONS          0.0       0.0          SUM ANIONS        0.0       0.000

        LABORATORY PH                  TOT HARDNESS(MG/L-CACO3)
ATER TEMPERATURE (C)                TOT ALKALINITY(MG/L-CACO3)
SS. IONS MEAS.(MG/L)                LABORATORY TURBIDITY (NTU)
NDUCTIVITY-UMHOS-25C                  SODIUM ADSORPTION RATIO

          A D D I T I O N A L   P A R A M E T E R S
ER,TR (MG/L AS CU)         .03         LEAD,TR (MG/L AS PB)      < .05
NC,TR (MG/L AS ZN)         .89     MERCURY, TR (MG/L AS HG)      < .0002
ON,TR (MG/L AS FE)         .64     MANGANESE,TR(MG/L AS MN)        1.19
      PH,FIELD(SU)         6.5     ANTIMONY (Tr mg/l as Sb)      < 0.2
N, TR (MG/L AS SN)      < 0.8

:  AML

TION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
NSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
EASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 NO AML 06   SAMPLER  BAM     HANDLING 11      ANALYST   08   LAB  WQBH
TED 1-07-79  COMPUTER RUN 11/26/79  DATA 0975/PROG 0876 FUND 6150
EV. N BALANCE 0.00         CA   MG   NA    K   CL  SO4  HCO3  CO3  NO3
T     MPDES                0.0  0.0  0.0  0.0 33.3 33.3  0.0 33.3  0.0
MEQ/L=INSUFFICIENT DATA                                           79W2298
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ALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

  STATE   MONTANA                                   COUNTY  JEFFERSON
-LONG.    462321N 112 123W               SAMPLE LOCATION    7N   3W   6ACA
N CODE                                   ANALYSIS NUMBER   79W2921
AMPLED    11-29-79                        DRAINAGE BASIN   0411 -U MISSOURI
AMPLED    1300                           WATER FLOW RATE          5.1 CFS(M)
AMPLED    GRAB                  FLOW MEASUREMENT METHOD   FLOW METER
SOURCE    STREAM                 ALTITUDE OF LAND SURFACE
ER USE    MULTIPLE              TOTAL WELL DEPTH BELOW LS
FER(S)                           SWL ABOVE(+) OR BELOW LS
LED BY    WQBH                 SAMPLE DEPTH BELOW SURFACE

  SAMPLING SITE: SPRING CR NEAR MOUTH

            MG/L        MEQ/L                                MG/L        MEQ/L
UM (CA)         56.4   28.144      BICARBONATE(HCO3)         81.7        1.340
UM (MG)     9.3         0.765        CARBONATE (CO3)          0.0        0.0
UM (NA)    10.3         0.448         CHLORIDE  (CL)          1.8        0.051
UM  (K)     2.0         0.051          SULFATE (SO4)        134.0        2.790
                                      FLUORIDE   (F)          0.14       0.007
                                PHOSPHATE(PO4 AS P)           0.016      0.002
                                  NO3+NO2 (TOT AS N)          0.47       0.034
          -------      -------                             -------     -------
 CATIONS   585.6        29.408              SUM ANIONS       218.2        4.223

        LABORATORY PH          8.06      TOT HARDNESS(MG/L-CACO3)   1447
ATER TEMPERATURE (C)           0.0     TOT ALKALINITY(MG/L-CACO3)     67
SS. IONS MEAS.(MG/L)         803.8     LABORATORY TURBIDITY (NTU)      7.9
NDUCTIVITY-UMHOS-25C         419.1        SODIUM ADSORPTION RATIO      0.1

           A D D I T I O N A L   P A R A M E T E R S
NT,TOT,SUSP (MG/L)       20.          ARSENIC,TR (MG/L AS AS)        .04
ER,TR (MG/L AS CU)         .03           LEAD,TR (MG/L AS PB)        .08
NC,TR (MG/L AS ZN)         .41       PHOSPHORUS,TOT (MG/L-P)         .03
Y, TR (MG/L AS HG)     < .0002           IRON,TR (MG/L AS FE)        .69
ESE,TR(MG/L AS MN)         .24                  PH,FIELD(SU)        8.05
A,TOTAL(MG/L AS N)         .01       NITROGEN,KJL,TOT(MG/L-N)        .19




S:  PRICKLY PEAR STUDY

ATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
NSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
EASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 NO 02          SAMPLER  ROB    HANDLING 4200   ANALYST  CLW   LAB  WQBH
TED 02-20-80  COMPUTER RUN 02/27/80  DATA 0975/PROG 0876 FUND 6053
DEV. ION BALANCE              CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
T       MPDES                 95.7  2.6   1.5   0.2  1.2 66.7  32.0  0.0  0.0
                                                                     79W2921
 MEQ/L=     3.985 TO          4.404
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TE HEALTH DEPT.       WATER QUALITY BUREAU        HELENA, MONTANA  59601

     STATE  MONTANA                                 COUNTY  JEFFERSON
 LAT.-LONG.  462248N 112 420W              SAMPLE LOCATION   7N  4W  2CDC
TATION CODE                                ANALYSIS NUMBER  80W0509
ATE SAMPLED  04-16-80                       DRAINAGE BASIN  041I -U MISSOURI
IME SAMPLED  1415                          WATER FLOW RATE        .3 CFS(M)
HOD SAMPLED  GRAB                 FLOW MEASUREMENT METHOD  FLOW METER
MPLE SOURCE  STREAM               ALTITUDE OF LAND SURFACE
  WATER USE  UNUSED              TOTAL WELL DEPTH BELOW LS
 AQUIFER(S)                       SWL ABOVE(+) OR BELOW LS
 SAMPLED BY  WQBH                SAMPLE DEPTH BELOW SURFACE

     SAMPLING SITE: CORBIN CREEK BELOW ALTA MINE DRAINAGE

                    MG/L      MEQ/L                           MG/L      MEQ/L
ALCIUM (CA)        147.0      7.335   BICARBONATE(HCO3)
NESIUM (MG)         47.3      3.891     CARBONATE (CO3)
SODIUM (NA)                              CHLORIDE  (CL)
ASSIUM  (K)                               SULFATE (SO4)  1306.0      27.191
                                         FLUORIDE   (F)
                                  PHOSPHATE(PO4 AS P)
                                    NO3+NO2 (TOT AS N)
DROGEN (H+)         2.06      2.042
                   ------    ------                         ------     ------
 SUM CATIONS       196.4     13.268            SUM ANIONS  1306.0      27.191

          LABORATORY PH        2.69     TOT HARDNESS(MG/L-CACO3)     561
LD WATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)
M-DISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)     440.
B CONDUCTIVITY-UMHOS-25C  2620.0         SODIUM ADSORPTION RATIO

               A D D I T I O N A L   P A R A M E T E R S
DIMENT,TOT,SUSP (MG/L)   662.       COPPER,TR (MG/L AS CU)      5.07
  ZINC,TR (MG/L AS ZN)   106.          IRON,TR (MG/L AS FE)   101.0
NGANESE,TR(MG/L AS MN)   148.                   PH,FIELD(SU)      3.6
NC, DISS(MG/L AS ZN)     103.      COPPER, DISS(MG/L AS CU)      4.49
ON,FERROUS,DISS (MG/L)    41.6     MANGANESE,DISS(MG/L-MN)     146.




ARKS:  SPRING CREEK SURVEY       NO T.TAKEN

LANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
  MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PLE NO 10        SAMPLER  GLI    HANDLING 4210    ANALYST   CW   LAB  WQBH
PLETED 10-14-80  COMPUTER RUN 10/16/80  DATA 0975/PROG 0376 FUND 6053
D DEV. ION BALANCE  9.99     CA    MG    NA    K    CL   SO4  HCO3   CO3   NO3
MENT       MPDES            65.3 34.7  0.0   0.0  0.0100.0  0.0   0.0   0.0
C. MEQ/L= INSUFFICIENT DATA                                        80W0509
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TE HEALTH DEPT.          WATER QUALITY BUREAU          HELENA, MONTANA  59601

      STATE   MONTANA                                    COUNTY   JEFFERSON
 LAT.-LONG.   462255N 112 325W                  SAMPLE LOCATION   7N  4W  1CCB
TATION CODE                                     ANALYSIS NUMBER   80W0508
ATE SAMPLED   04-16-80                           DRAINAGE BASIN   0411 -U MISSOURI
IME SAMPLED   1400                              WATER FLOW RATE           .3 CFS(M)
HOD SAMPLED   GRAB                      FLOW MEASUREMENT METHOD   FLOW METER
MPLE SOURCE   STREAM                   ALTITUDE OF LAND SURFACE
  WATER USE   UNUSED                  TOTAL WELL DEPTH BELOW LS
 AQUIFER(S)                            SWL ABOVE(+) OR BELOW LS
 SAMPLED BY   WQBH                    SAMPLE DEPTH BELOW SURFACE

      SAMPLING SITE: CORBIN CREEK AT MOUTH

                   MG/L       MEQ/L                                  MG/L        MEQ/L
ALCIUM (CA)       113.0       5.838    BICARBONATE(HCO3)
NESIUM (MG)        38.4       3.159      CARBONATE (CO3)
SODIUM (NA)                               CHLORIDE   (CL)
ASSIUM  (K)                                SULFATE (SO4)   829.0       17.260
                                          FLUORIDE    (F)
                                     PHOSPHATE(PO4 AS P)
                                       NO3+NO2 (TOT AS N)
DROGEN (H+)         0.78       0.776
                  -------     -------                         -------      -------
 SUM CATIONS      157.2       9.823             SUM ANIONS     829.0        17.260

            LABORATORY PH        3.11     TOT HARDNESS(MG/L-CACO3)     452
LD WATER TEMPERATURE (C)                 TOT ALKALINITY(MG/L-CACO3)
M-DISS. IONS MEAS.(MG/L)                 LABORATORY TURBIDITY (NTU)    230.
B CONDUCTIVITY-UMHOS-25C  1671.0            SODIUM ADSORPTION RATIO

                ADDITIONAL   PARAMETERS
DIMENT,TOT,SUSP (MG/L)   291.        COPPER,TR (MG/L AS CU)      3.40
  ZINC,TR (MG/L AS ZN)    61.0           IRON,TR (MG/L AS FE)   47.90
NGANESE,TR(MG/L AS MN)    76.20                   PH,FIELD(SU)    7.0
NC, DISS(MG/L AS ZN)      61.0      COPPER, DISS(MG/L AS CU)     3.00
ON,FERROUS,DISS (MG/L)     6.49     MANGANESE,DISS(MG/L-MN)     76.20




ARKS:  SPRING CREEK SURVEY       NO T.TAKEN

LANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PLE NO 09        SAMPLER  GLI    HANDLING 4210   ANALYST   CW   LAB  WQBH
PLETED 10-14-80  COMPUTER RUN 10/16/80  DATA 0975/PROG 0875 FUND 6053
D DEV. ION BALANCE  9.99      CA    MG    NA    K    CL   SO4   HCO3  CO3   NO3
MENT       MPDES             65.1 34.9   0.0   0.0  0.0100.0  0.0   0.0   0.0
C. MEQ/L= INSUFFICIENT DATA                                            80W0508
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TE HEALTH DEPT.         WATER QUALITY BUREAU          HELENA, MONTANA  59601

      STATE  MONTANA                                  COUNTY  JEFFERSON
  LAT.-LONG.  4623 1N 112 3 7W               SAMPLE LOCATION   7N  4W  1CAC
TATION CODE                                  ANALYSIS NUMBER  80W0506
ATE SAMPLED  04-16-80                          DRAINAGE BASIN  0411 -U MISSOURI
IME SAMPLED  1330                              WATER FLOW RATE       2.8 CFS(M)
HOD SAMPLED  GRAB                  FLOW MEASUREMENT METHOD  FLOW METER
MPLE SOURCE  STREAM                ALTITUDE OF LAND SURFACE
  WATER USE  MULTIPLE             TOTAL WELL DEPTH BELOW LS
 AQUIFER(S)                         SWL ABOVE(+) OR BELOW LS
 SAMPLED BY  WQBH                 SAMPLE DEPTH BELOW SURFACE

     SAMPLING SITE: SPRING CREEK BELOW CORBIN CREEK AT CORBIN

                 MG/L      MEQ/L                               MG/L       MEQ/L
ALCIUM (CA)      58.7      2.929    BICARBONATE(HCO3)          28.1       0.460
NESIUM (MG)      11.1      0.913      CARBONATE (CO3)          0.0        0.0
 SODIUM (NA)                           CHLORIDE  (CL)
ASSIUM  (K)                             SULFATE (SO4)        177.0        3.685
                                       FLUORIDE    (F)
                                   PHOSPHATE(PO4 AS P)
                                     NO3+NO2 (TOT AS N)

                 -----     -----                              -----       -----
 SUM CATIONS     69.8      3.842          SUM ANIONS         205.1        4.145

         LABORATORY PH       9.25    TOT HARDNESS(MG/L-CACO3)    192
LD WATER TEMPERATURE (C)             TOT ALKALINITY(MG/L-CACO3)   23
M-DISS. IONS MEAS.(MG/L)             LABORATORY TURBIDITY (NTU)   24.
B CONDUCTIVITY-UMHOS-25C   450.0      SODIUM ADSORPTION RATIO

              A D D I T I O N A L   P A R A M E T E R S
EDIMENT,TOT,SUSP (MG/L)    25.8       COPPER,TR (MG/L AS CU)      .21
  ZINC,TR (MG/L AS ZN)      4.66        IRON,TR (MG/L AS FE)      3.62
ANGANESE,TR(MG/L AS MN)     5.95                PH,FIELD(SU)      7.2
INC, DISS(MG/L AS ZN)       3.96    IRON,FERROUS,DISS (MG/L)    < 0.01
OPPER, DISS(MG/L AS CU)     .02     MANGANESE,DISS(MG/L-MN)       5.93




ARKS:  SPRING CREEK SURVEY      NO T.TAKEN

LANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
  MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
MPLE NO 07        SAMPLER  GLI    HANDLING 4210   ANALYST   CW   LAB  WQBH
MPLETED 10-14-80  COMPUTER RUN 10/16/80  DATA 0975/PROG 0876 FUND 6053
D DEV. ION BALANCE  1.99       CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
MENT        NPDES            76.2  23.8  0.0   0.0  0.0  88.9 11.1  0.0  0.0
C. MEQ/L= INSUFFICIENT DATA                                          80W0506
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DEPT. WATER QUALITY BUREAU HELENA, MONTANA 59601

TATE	MONTANA	COUNTY	JEFFERSON
ONG.	462242N 112 334W	SAMPLE LOCATION	7N 4W 11AAA
CCDE		ANALYSIS NUMBER	80W0507
MPLED	04-16-80	DRAINAGE BASIN	0411 -U MISSOURI
MPLED	1500	WATER FLCW RATE	3.4 CFS(M)
MPLED	GRAB	FLOW MEASUREMENT METHOD	FLOW METER
SOURCE	STREAM	ALTITUDE CF LAND SURFACE	
ER USE	MULTIPLE	TCTAL WELL DEPTH BELOW LS	
FER(S)		SWL ABOVE(+) OR BELOW LS	
LED BY	WQBH	SAMPLE DEPTH BELOW SURFACE	

SAMPLING SITE: SPRING CREEK ABOVE CORBIN CREEK

	MG/L	MEQ/L		MG/L	MEQ/L
M (CA)	40.4	2.016	BICARBONATE(HCO3)	36.8	0.604
M (MG)	8.7	0.714	CARBONATE (CO3)	0.0	0.0
M (NA)			CHLORIDE (CL)		
M (K)			SULFATE (SO4)	119.0	2.478
			FLUORIDE (F)		
			PHOSPHATE(PO4 AS P)		
			NO3+NO2 (TOT AS N)		
CATIONS	49.1	2.730	SUM ANIONS	155.8	3.081

LABORATORY PH	8.80	TOT HARDNESS(MG/L-CACO3)	137
TER TEMPERATURE (C)		TOT ALKALINITY(MG/L-CACO3)	30
S. IONS MEAS.(MG/L)		LABORATORY TURBIDITY (NTU)	.5
DUCTIVITY-UMHOS-25C	337.0	SODIUM ADSORPTION RATIO	

ADDITIONAL PARAMETERS

T.TOT.SUSP (MG/L) ✓	5.3	COPPER.TR (MG/L AS CU)	< .01
C.TR (MG/L AS ZN)	.05	IRON.TR (MG/L AS FE)	.11
SE.TR(MG/L AS MN)	.03	PH.FIELD(SU)	7.8
ISS(MG/L AS ZN)	.04	COPPER. DISS(MG/L AS CU)	< 0.01
RROUS.DISS (MG/L)	.01	MANGANESE.DISS(MG/L-MN)	.01

SPRING CREEK SURVEY NO T.TAKEN

ION: MG/L=MILLIGRAMS PER LITER MEQ/L=MILLIEQUIVILENTS PER LITER
STITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
SURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE

- -

O 08 SAMPLER GLI HANDLING 4210 ANALYST CW LAB WQBH
D 10-14-80 COMPUTER RUN 10/16/80 DATA 097S/PROG 0876 FUND 6053

	CA	MG	NA	K	CL	SO4	HCO3	CO3	NO3
. ION BALANCE 2.60									
MPDES	73.8	26.2	0.0	0.0	0.0	80.4	19.6	0.0	0.0

Q/L= INSUFFICIENT DATA 80W0507

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  H DEPT.         WATER QUALITY BUREAU         HELENA, MONTANA  59601

TATE   MONTANA                                  COUNTY     JEFFERSON
LONG.  462321N 112 132W                  SAMPLE LOCATION    7N   3W   6ACB
 CODE                                    ANALYSIS NUMBER   80W0505
MPLED  04-16-80                           DRAINAGE BASIN   0411 -U MISSOURI
AMPLED 1200                               WATER FLOW RATE        2.0 CFS(M)
AMPLED GRAB                      FLOW MEASUREMENT METHOD   FLOW METER
SOURCE STREAM                     ALTITUDE OF LAND SURFACE
ER USE MULTIPLE                  TOTAL WELL DEPTH BELOW LS
FER(S)                            SWL ABOVE(+) OR BELOW LS
LED BY WQBH                     SAMPLE DEPTH BELOW SURFACE

 SAMPLING SITE: SPRING CREEK NEAR MOUTH AT JEFFERSON CITY

             MG/L      MEQ/L                              MG/L       MEQ/L
M (CA)       58.3      2.909    BICARBONATE(HCO3)         32.6       0.534
M (MG)       11.2      0.921      CARBONATE (CO3)          0.0         0.0
M (NA)                             CHLORIDE  (CL)
M  (K)                              SULFATE (SO4)        173.0       3.602
                                   FLUORIDE    (F)
                              PHOSPHATE(PO4 AS P)
                               NO3+NO2 (TOT AS N)
            ------     ------                           ------      ------
CATIONS      69.5      3.831          SUM ANIONS         205.6       4.136

     LABORATORY PH        9.60    TOT HARDNESS(MG/L-CACO3)     192
TER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)    27
S. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (NTU)    25.
DUCTIVITY-UMHOS-25C   450.0          SODIUM ADSORPTION RATIO

         ADDITIONAL   PARAMETERS
T.TOT.SUSP (MG/L)     40.6         COPPER.TR (MG/L AS CU)       .20
C.TR (MG/L AS ZN)      4.12          IRON.TR (MG/L AS FE)      3.40
SE.TR(MG/L AS MN)      5.61                  PH.FIELD(SU)       7.7
ISS(MG/L AS ZN)        2.39     Copper(DISS) ~~[illegible]~~          .01
RROUS.DISS (MG/L)       .01     MANGANESE.DISS(MG/L-MN)        5.14



 SPRING CREEK SURVEY        NO T.TAKEN

ION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
TITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
SURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
D 06          SAMPLER  GLI    HANDLING 4210   ANALYST  CW   LAB  WQBH
D 10-14-80  COMPUTER RUN 10/16/80  DATA 0976/PROG 0876 FUND 6053
. ION BALANCE  2.01       CA    MG    NA     K    CL   SO4  HCO3   CO3   NO3
    MPDES                75.9  24.1   0.0   0.0   0.0  87.1  12.9   0.0   0.0
Q/L= INSUFFICIENT DATA                                              80W0505
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HEALTH DEPT.          WATER QUALITY BUREAU           HELENA, MONTANA  59601

   STATE  MONTANA                                     COUNTY  JEFFERSON
T.-LONG.  462321N 112 123W                   SAMPLE LOCATION   7N  3W  6ACA
ION CODE                                     ANALYSIS NUMBER  80W0716
 SAMPLED  05-14-80                            DRAINAGE BASIN  0411 -U MISSOURI
 SAMPLED  1200                               WATER FLOW RATE       4.1 CFS(M)
 SAMPLED  GRAB                      FLOW MEASUREMENT METHOD  FLOW METER
E SOURCE  STREAM                     ALTITUDE OF LAND SURFACE
ATER USE  MULTIPLE                  TOTAL WELL DEPTH BELOW LS
UIFER(S)                             SWL ABOVE(+) OR BELOW LS
MPLED BY  WQBH                     SAMPLE DEPTH BELOW SURFACE

    SAMPLING SITE: SPRING CR NEAR MOUTH

                MG/L      MEQ/L                                MG/L      MEQ/L
CIUM (CA)       71.6        3.573   BICARBONATE(HCO3)
SIUM (MG)       15.5        1.275     CARBONATE (CO3)
DIUM (NA)                              CHLORIDE   (CL)
SIUM  (K)                               SULFATE (SO4)   227.0        4.726
                                       FLUORIDE    (F)
                                   PHOSPHATE(PO4 AS P)     0.130      0.013
                                    NO3+NO2 (TOT AS N)     0.38       0.027

                -------   -------                       -------    -------
M CATIONS        87.1       4.848          SUM ANIONS   227.5        4.766

        LABORATORY PH        4.16    TOT HARDNESS(MG/L-CACO3)    243
WATER TEMPERATURE (C)       14.0    TOT ALKALINITY(MG/L-CACO3)
ISS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (NTU)    61.
ONDUCTIVITY-UMHOS-25C   708.0         SODIUM ADSORPTION RATIO

          A D D I T I O N A L   P A R A M E T E R S
ENT.TOT.SUSP (MG/L)     97.6        ARSENIC.TR (MG/L AS AS)        .096
PPER.TR (MG/L AS CU)     1.00             LEAD.TR (MG/L AS PB)       .20
ZINC.TR (MG/L AS ZN)    18.60       PHOSPHOROUS.TOT (MG/L-P)        .14
IRON.TR (MG/L AS FE)    20.70       MANGANESE.TR(MG/L AS MN)     22.90
       PH.FIELD(SU)      3.1        ARSENIC.DISS(MG/L AS AS)    < 0.001
FERROUS.DISS (MG/L)       .99       COPPER. DISS(MG/L AS CU)        .89
ANESE.DISS(MG/L-MN)     22.40       LEAD. DISS(MG/L AS PB)      < 0.05
 DISS(MG/L AS ZN)       18.30       AMMONIA.TOTAL(MG/L AS N)        .04
OGEN.KJL.TOT(MG/L-N)      .07





KS:  PRICKLY PEAR STUDY        FIELD PH QUESTIONABLE-SEE LAB PH
                                          ALKALINITY NOT ANALYZABLE
NATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
ONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
E NO 02         SAMPLER  ROB    HANDLING 5310    ANALYST  DME    LAB  WQBH
ETED 01-09-81  COMPUTER RUN 01/13/81  DATA 0975/PROG 0876 FUND 6053
DEV. ION BALANCE -0.50      CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
NT      MPDES             73.7 26.3  0.0  0.0  0.0100.0  0.0  0.0  0.0
 MEQ/L= INSUFFICIENT DATA                                        80W0716
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TE HEALTH DEPT.        WATER QUALITY BUREAU        HELENA, MONTANA  59601

      STATE   MONTANA                                  COUNTY  JEFFERSON
 AT.-LONG.                                  SAMPLE LOCATION    7N   4W    DCB
TATION CODE                                 ANALYSIS NUMBER   80W0880
ATE SAMPLED   05-30-80                       DRAINAGE BASIN   0411 -U MISSOURI
IME SAMPLED   1530                           WATER FLOW RATE         1.   GPM(E)
HOD SAMPLED   GRAB                   FLOW MEASUREMENT METHOD  NOT MEASURED
MPLE SOURCE   SPRING                 ALTITUDE OF LAND SURFACE
  WATER USE   DOMESTIC              TOTAL WELL DEPTH BELOW LS
 AQUIFER(S)                          SWL ABOVE(+) OR BELOW LS
 SAMPLED BY   WQBH                 SAMPLE DEPTH BELOW SURFACE

      SAMPLING SITE: GEORGE FUSSELL SPRING ABOVE CORBIN MONT

                MG/L      MEQ/L                          MG/L      MEQ/L
ALCIUM (CA)     44.4      2.216   BICARBONATE(HCO3)     113.0      1.851
NESIUM (MG)     14.6      1.201     CARBONATE (CO3)       0.0      0.0
 SODIUM (NA)     8.7      0.377      CHLORIDE  (CL)
ASSIUM  (K)                           SULFATE (SO4)     105.0      2.186
                                     FLUORIDE    (F)
                                PHOSPHATE(PO4 AS P)     < .01
                                 NO3+NO2 (TOT AS N)      0.82      0.059

 SUM CATIONS    67.7      3.794         SUM ANIONS      218.8      4.096

           LABORATORY PH       7.27     TOT HARDNESS(MG/L-CACO3)    171
  WATER TEMPERATURE (C)                TOT ALKALINITY(MG/L-CACO3)    93
M-DISS. IONS MEAS.(MG/L)               LABORATORY TURBIDITY (NTU)
B CONDUCTIVITY-UMHOS-25C  403.0           SODIUM ADSORPTION RATIO    0.3

              A D D I T I O N A L   P A R A M E T E R S
RSENIC,TR (MG/L AS AS)    < .001      COPPER,TR (MG/L AS CU)        .03
   ZINC,TR (MG/L AS ZN)      .02     PHOSPHOROUS,TOT (MG/L-P)      <.01
   IRON,TR (MG/L AS FE)      .01     MANGANESE,TR(MG/L AS MN)    < .005
MONIA,TOTAL(MG/L AS N)   < 0.01

MARKS:  CORBIN WELL STUDY

PLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
LE NO 02       SAMPLER  GLI    HANDLING 3200    ANALYST   CW   LAB   WQBH
LETED 10-14-80  COMPUTER RUN 10/16/80  DATA 0975/PROG 0876 FUND 6053
D DEV. ION BALANCE  2.00      CA    MG    NA     K    CL   SO4  HCO3  CO3   NO3
GMENT        MPDES           53.4  31.7   9.9   0.0   0.0  54.1  45.9  0.0   0.0
C. MEQ/L= INSUFFICIENT DATA                                           80W0880
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E HEALTH DEPT.          WATER QUALITY BUREAU          HELENA, MONTANA  59601

      STATE  MONTANA                                      COUNTY  JEFFERSON
 LAT.-LONG.  462255N 112 230W                  SAMPLE LOCATION  7N  4W  10DB
 ATION CODE                                    ANALYSIS NUMBER  80W0881
 TE SAMPLED  05-30-80                           DRAINAGE BASIN  041I -U MISSOURI
 ME SAMPLED  1430                              WATER FLOW RATE
 OD SAMPLED  GRAB                      FLOW MEASUREMENT METHOD
 PLE SOURCE  WELL                     ALTITUDE OF LAND SURFACE
  WATER USE  DOMESTIC               TOTAL WELL DEPTH BELOW LS     93 FT
 AQUIFER(S)                           SWL ABOVE(+) OR BELOW LS
 SAMPLED BY  WQBH                  SAMPLE DEPTH BELOW SURFACE    53 FT

     SAMPLING SITE: LEO ZITNIK WELL IN CORBIN,MONTANA

                  MG/L      MEQ/L                                MG/L       MEQ/L
ALCIUM (CA)       87.0      4.341   BICARBONATE(HCO3)          134.2       2.199
NESIUM (MG)       35.6      2.929     CARBONATE (CO3)            0.0         0.0
SODIUM (NA)       15.0      0.652      CHLORIDE   (CL)
ASSIUM  (K)                             SULFATE (SO4)          247.0       5.143
                                       FLUORIDE    (F)
                                 PHOSPHATE(PO4 AS P)           < .01
                                  NO3+NO2 (TOT AS N)            0.76       0.054

 SUM CATIONS    137.6       7.922          SUM ANIONS          282.0       7.396

         LABORATORY PH        7.28    TOT HARDNESS(MG/L-CACO3)   348
LD WATER TEMPERATURE (C)             TOT ALKALINITY(MG/L-CACO3)  110
-DISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
B CONDUCTIVITY-UMHOS-25C   720.0       SODIUM ADSORPTION RATIO      0.3

               A D D I T I O N A L   P A R A M E T E R S
RSENIC,TR (MG/L AS AS)    < .001     COPPER,TR (MG/L AS CU)        < .01
  ZINC,TR (MG/L AS ZN)      1.47     PHOSPHOROUS,TOT (MG/L-P)      <.01
  IRON,TR (MG/L AS FE)       .55     MANGANESE,TR(MG/L AS MN)       .01
MONIA,TOTAL(MG/L AS N)   < 0.01

ARKS: _ CORBIN WELL STUDY

LANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PLE NO 01        SAMPLER  GLI     HANDLING 3200    ANALYST    CW    LAB  WQBH
PLETED 10-14-80  COMPUTER RUN 10/16/80  DATA 0975/PROG 0876 FUND 6053
D DEV. ION BALANCE -2.52      CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
MENT        MPDES           54.8 37.0  8.2  0.0  0.0 70.0 30.0  0.0  0.0
C. MEQ/L= INSUFFICIENT DATA                                        80W0881
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HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

     STATE  MONTANA                                     COUNTY  JEFFERSON
 LAT.-LONG.  462248N 112 343W               SAMPLE LOCATION   7N  4W  20DC
TATION CODE                                 ANALYSIS NUMBER  80W1045
ATE SAMPLED  06-13-80                        DRAINAGE BASIN  0411 -U MISSOURI
IME SAMPLED  1430                           WATER FLOW RATE
HOD SAMPLED  TIME COMPOSITE         FLOW MEASUREMENT METHOD
MPLE SOURCE  WELL                   ALTITUDE OF LAND SURFACE   4000.  FT
  WATER USE  DOMESTIC              TOTAL WELL DEPTH BELOW LS     14 FT
 AQUIFER(S)                         SWL ABOVE(+) OR BELOW LS
 SAMPLED BY  WQBH                  SAMPLE DEPTH BELOW SURFACE     2  FT

     SAMPLING SITE: R.W.ROANE WELL-CORBIN MONTANA

                MG/L      MEQ/L                           MG/L       MEQ/L
ALCIUM (CA)    144.0      7.186   BICARBONATE(HCO3)
NESIUM (MG)     42.7      3.513     CARBONATE (CO3)
SODIUM (NA)     15.0      0.652      CHLORIDE  (CL)
ASSIUM  (K)                           SULFATE (SO4)   675.0      14.053
                                    FLUORIDE    (F)
                                 PHOSPHATE(PO4 AS P)    0.055      0.005
                                  NO3+NO2 (TOT AS N)    1.50       0.107
                ______    ______                      ______     ______
 SUM CATIONS    201.7     11.351         SUM ANIONS   676.6      14.166

         LABORATORY PH         4.26     TOT HARDNESS(MG/L-CACO3)   535
ELD WATER TEMPERATURE (C)              TOT ALKALINITY(MG/L-CACO3)
JM-DISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
AB CONDUCTIVITY-UMHOS-25C  1232.0        SODIUM ADSORPTION RATIO    0.3

                A D D I T I O N A L   P A R A M E T E R S
ARSENIC,TR (MG/L AS AS)     < .001      COPPER,TR (MG/L AS CU)     1.55
  ZINC,TR (MG/L AS ZN)      43.76      PHOSPHOROUS,TOT (MG/L-P)    .049
  IRON,TR (MG/L AS FE)      < .01      MANGANESE,TR(MG/L AS MN)   34.93
MONIA,TOTAL(MG/L AS N)     < 0.01




ARKS: - CORBIN WELL MONITORING

PLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
- CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
  MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
MPLE NO 04         SAMPLER  GLI    HANDLING 1200    ANALYST   CW    LAB  WQBH
MPLETED 10-14-80  COMPUTER RUN 10/16/80  DATA 0975/PROG 0876 FUND 6053
ND DEV. ION BALANCE  9.78       CA    MG    NA     K    CL   SO4   HCO3   CO3   NO3
GMENT       MPDES             63.3 30.9   5.7   0.0   0.0100.0   0.0   0.0   0.0
LC. MEQ/L= INSUFFICIENT DATA                                            80W1045
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HEALTH DEPT.       WATER QUALITY BUREAU        HELENA, MONTANA  59601

   STATE  MONTANA                              COUNTY  JEFFERSON
.-LONG.   462321N 112 151W            SAMPLE LOCATION   7N   3W   6808
ON CCDE                               ANALYSIS NUMBER  81W0698
SAMPLED   04-21-81                     DRAINAGE BASIN  0411I -U MISSOURI
SAMPLED                               WATER FLOW RATE
SAMPLED   GRAB                  FLOW MEASUREMENT METHOD
 SOURCE   STREAM               ALTITUDE OF LAND SURFACE
TER USE   MULTIPLE            TOTAL WELL DEPTH BELOW LS
IFER(S)                        SWL ABOVE(+) OR BELOW LS
PLED BY   FW&P               SAMPLE DEPTH BELOW SURFACE

   SAMPLING SITE: SPRING CREEK NEAR ITS MOUTH

               MG/L      MEQ/L                           MG/L       MEQ/L
UM (CA)                          BICARBONATE(HCO3)      31.1        0.510
UM (MG)                            CARBONATE (CO3)       0.0        0.0
UM (NA)                             CHLORIDE  (CL)
UM  (K)                              SULFATE (SO4)    251.0         5.226
                                    FLUORIDE   (F)
                                PHOSPHATE(PO4 AS P)
                                 NO3+NO2 (TOT AS N)

               ------     ------                        ------      ------
M CATIONS       0.0        0.0               SUM ANIONS  282.1       5.736

        LABORATORY PH         7.34    TOT HARDNESS(MG/L-CACO3)    267
WATER TEMPERATURE (C)                TOT ALKALINITY(MG/L-CACO3)    26
ISS. IONS MEAS.(MG/L)                LABORATORY TURBIDITY (NTU)
ONDUCTIVITY-UMHOS-25C   567.0          SODIUM ADSORPTION RATIO

             A D D I T I O N A L   P A R A M E T E R S
UM, TR (MG/L AS CD)      .032       COPPER,TR (MG/L AS CU)       .42
INC,TR (MG/L AS ZN)    10.            IRON,TR (MG/L AS FE)      8.2
NESE,TR(MG/L AS MN)    14.       IRON,FERROUS,DISS (MG/L)        .01
R, DISS(MG/L AS CU)      .03     CADMIUM,DISS(MG/L AS CD)        .026
NESE,DISS(MG/L-MN)     13.       ZINC, DISS(MG/L AS ZN)         8.2






S: FW&P PRICKLY PEAR BIOASSAY

ATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
NSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
EASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 NO           SAMPLER  KH    HANDLING 3210   ANALYST  DME    LAB  WQBH
TED 05-07-81  COMPUTER RUN 05/12/81  DATA 0975/PROG 0876 FUND 6053
EV. ICN BALANCE  9.99       CA   MG   NA    K    CL  SO4  HCO3  CO3  NO3
T      MPDES               0.0  0.0  0.0  0.0  0.0 91.1  8.9  0.0  0.0
MEQ/L= INSUFFICIENT DATA                                        81W0698
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ALTH DEPT.          WATER QUALITY BUREAU          HELENA. MONTANA  59601

STATE   MONTANA                                 COUNTY  JEFFERSON
-LONG.  462321N 112 151W               SAMPLE LOCATION   7N  3W   6BDB
H CODE                                 ANALYSIS NUMBER  81W0703
AMPLED  04-23-81                        DRAINAGE BASIN  041I -U MISSOURI
AMPLED                                 WATER FLOW RATE      4.5 CFS(M)
AMPLED  GRAB                 FLOW MEASUREMENT METHOD  FLOW METER
SOURCE  STREAM               ALTITUDE OF LAND SURFACE
ER USE  MULTIPLE            TOTAL WELL DEPTH BELOW LS
IFER(S)                      SWL ABOVE(+) OR BELOW LS
LED BY  FW&P               SAMPLE DEPTH BELOW SURFACE

 SAMPLING SITE: SPRING CR NEAR ITS MOUTH

            MG/L       MEQ/L                            MG/L       MEQ/L
UM (CA)                          BICARBONATE(HCO3)      26.8        0.440
UM (MG)                            CARBONATE (CO3)       0.0        0.0
UM (NA)                             CHLORIDE  (CL)
UM  (K)                              SULFATE (SO4)     235.0        4.893
                                    FLUORIDE   (F)
                               PHOSPHATE(PO4 AS P)
                                NO3+NO2 (TOT AS N)

            ______     ______                          ______     ______
 CATIONS     0.0        0.0              SUM ANIONS    261.8        5.333

     LABORATORY PH       7.33      TOT HARDNESS(MG/L-CACO3)    250
ATER TEMPERATURE (C)              TOT ALKALINITY(MG/L-CACO3)    22
SS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
NDUCTIVITY-UMHOS-25C   542.0        SODIUM ADSORPTION RATIO

          A D D I T I O N A L   P A R A M E T E R S
M.TR (MG/L AS CD)       .026       COPPER.TR (MG/L AS CU)       .36
NC.TR (MG/L AS ZN)     8.2           IRON.TR (MG/L AS FE)      7.2
ESE.TR(MG/L AS MN)    11.         IRON.FERROUS.DISS (MG/L)   < 0.01
R.DISS(MG/L AS CU)      .02       CADMIUM.DISS(MG/L AS CD)     .021
ESE.DISS(MG/L-MN)     10.         ZINC. DISS(MG/L AS ZN)       5.7





S: FW&P PRICKLY PEAR BIOASSAY

ATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
NSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
EASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 NO
         SAMPLER  KH     HANDLING 3210   ANALYST  DME    LAB  WQBH
TED 05-07-81  COMPUTER RUN 05/12/81  DATA 0975/PROG 0876 FUND 6053
EV. ION BALANCE  9.99     CA    MG    NA    K    CL   SO4  HCO3  CO3   NO3
T      MPDES              0.0   0.0   0.0  0.0  0.0 91.8   8.2  0.0   0.0
MEQ/L= INSUFFICIENT DATA                                           81W0703
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ALTH DEPT.        WATER QUALITY BUREAU         HELENA, MONTANA  59601

 STATE  MONTANA                                   COUNTY  JEFFERSON
 LONG.  462321N 112 151W                 SAMPLE LOCATION   7N  3W  6BDB
N CODE                                   ANALYSIS NUMBER  81W0745
AMPLED  05-05-81                          DRAINAGE BASIN  0411 -U MISSOURI
AMPLED                                   WATER FLOW RATE        3.7 CFS(M)
AMPLED  GRAB                   FLOW MEASUREMENT METHOD  FLOW METER
SOURCE  STREAM                  ALTITUDE OF LAND SURFACE
ER USE  MULTIPLE               TOTAL WELL DEPTH BELOW LS
FER(S)                          SWL ABOVE(+) OR BELOW LS
LED BY  FW&P                  SAMPLE DEPTH BELOW SURFACE

 SAMPLING SITE: SPRING CRK NEAR ITS MOUTH

                MG/L      MEQ/L                            MG/L      MEQ/L
UM (CA)         62.9       3.139   BICARBONATE(HCO3)       61.0       1.000
UM (MG)         14.0       1.152     CARBONATE (CO3)        0.0       0.0
UM (NA)                               CHLORIDE   (CL)
UM  (K)                                SULFATE (SO4)      189.0       3.935
                                      FLUORIDE    (F)
                                 PHOSPHATE(PO4 AS P)
                                  NO3+NO2 (TOT AS N)

               ------     ------                         ------     ------
CATIONS         76.9       4.290           SUM ANIONS     250.0       4.935

     LABORATORY PH        7.78     TOT HARDNESS(MG/L-CACO3)    215
ATER TEMPERATURE (C)              TOT ALKALINITY(MG/L-CACO3)    50
SS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
NDUCTIVITY-UMHOS-25C   496.0         SODIUM ADSORPTION RATIO

            A D D I T I O N A L   P A R A M E T E R S
M, TR (MG/L AS CD)        .01       COPPER,TR (MG/L AS CU)      .16
NC,TR (MG/L AS ZN)        4.2          IRON,TR (MG/L AS FE)     3.2
ESE.TR(MG/L AS MN)        5.6     IRON,FERROUS,DISS (MG/L)   < 0.01
M.DISS(MG/L AS CD)        .01     COPPER, DISS(MG/L AS CU)      .01
ESE.DISS(MG/L-MN)         5.3     ZINC, DISS(MG/L AS ZN)        2.5





S: FW&P PRICKLY PEAR BIOASSAY

ATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
NSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
EASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
 NO          SAMPLER  KH      HANDLING 3210    ANALYST  DME    LAB  WQBH
TED 05-19-81  COMPUTER RUN 06/11/81  DATA 0975/PROG 0876 FUND 6053
EV. ION BALANCE  3.99      CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
T      MPDES             73.2 26.8  0.0  0.0  0.0 79.7 20.3  0.0  0.0
MEQ/L= INSUFFICIENT DATA                                          81W0745
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ALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

 STATE   MONTANA                                    COUNTY   JEFFERSON
-LONG.   462321N 112 151W               SAMPLE LOCATION    7N   3W   6BDB
N CODE                                  ANALYSIS NUMBER   81W0759
SAMPLED  05-07-81                         DRAINAGE BASIN   0411 -U MISSOURI
SAMPLED                                 WATER FLOW RATE        3.9 CFS(M)
SAMPLED  GRAB                  FLOW MEASUREMENT METHOD   FLOW METER
 SOURCE  STREAM                  ALTITUDE OF LAND SURFACE
TER USE  MULTIPLE               TOTAL WELL DEPTH BELOW LS
IFER(S)                          SWL ABOVE(+) OR BELOW LS
PLED BY  FW&P                   SAMPLE DEPTH BELOW SURFACE

  SAMPLING SITE: SPRING CR NEAR ITS MOUTH

              MG/L       MEQ/L                                 MG/L        MEQ/L
UM (CA)       63.7        3.179   BICARBONATE(HCO3)            58.6         0.960
UM (MG)       14.2        1.168     CARBONATE (CO3)             0.0         0.0
UM (NA)                              CHLORIDE   (CL)
UM  (K)                               SULFATE (SO4)           191.0         3.977
                                     FLUORIDE    (F)
                                 PHOSPHATE(PO4 AS P)
                                  NO3+NO2 (TOT AS N)

              -----       -----                                -----        -----
 CATIONS      77.9        4.347          SUM ANIONS           249.6         4.936

      LABORATORY PH        7.77     TOT HARDNESS(MG/L-CACO3)    218
ATER TEMPERATURE (C)               TOT ALKALINITY(MG/L-CACO3)    48
ISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
ONDUCTIVITY-UMHOS-25C    496.0        SODIUM ADSORPTION RATIO

             A D D I T I O N A L   P A R A M E T E R S
UM. TR (MG/L AS CD)       .01       COPPER.TR (MG/L AS CU)       .16
INC.TR (MG/L AS ZN)      4.1          IRON.TR (MG/L AS FE)      2.9
NESE.TR(MG/L AS MN)      5.8       IRON.FERROUS.DISS (MG/L)   < 0.01
R. DISS(MG/L AS CU)       .01      CADMIUM.DISS(MG/L AS CD)      .01
NESE.DISS(MG/L-MN)       5.6       ZINC. DISS(MG/L AS ZN)       2.6







S: FW&P PRICKLY PEAR BIOASSAY

NATION: MG/L=MILLIGRAMS PER LITER   MEQ/L=MILLIEQUIVILENTS PER LITER
ONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
E NO           SAMPLER  KH     HANDLING 3210    ANALYST  DME    LAB  WQBH
ETED 05-19-81  COMPUTER RUN 06/11/81  DATA 0975/PROG 0876 FUND 6053
DEV. ION BALANCE  3.64      CA    MG    NA    K    CL   SO4  HCO3  CO3  NO3
NT     MPDES              73.1  26.9   0.0  0.0   0.0  80.6  19.4  0.0  0.0
 MEQ/L= INSUFFICIENT DATA                                           81W0759
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HEALTH DEPT.        WATER QUALITY BUREAU          HELENA, MONTANA  59601

   STATE  MONTANA                                  COUNTY  JEFFERSON
T.-LONG.  462321N 112 132W                SAMPLE LOCATION   7N  3W  6ACB
ION CODE                                  ANALYSIS NUMBER  81W0863
E SAMPLED  05-22-81                        DRAINAGE BASIN   41I
E SAMPLED                                  WATER FLOW RATE
D SAMPLED  GRAB                      FLOW MEASUREMENT METHOD
LE SOURCE  STREAM                   ALTITUDE OF LAND SURFACE
WATER USE  MULTIPLE                TOTAL WELL DEPTH BELOW LS
QUIFER(S)                           SWL ABOVE(+) OR BELOW LS
AMPLED BY  DFWP                    SAMPLE DEPTH BELOW SURFACE

   SAMPLING SITE: SPRING CR NEAR ITS MOUTH

               MG/L      MEQ/L                            MG/L      MEQ/L
CIUM  (CA)     119.0      5.938  BICARBONATE(HCO3)       14.6       0.240
SIUM  (MG)      25.3      2.081    CARBONATE (CO3)        0.0       0.0
DIUM  (NA)                          CHLORIDE  (CL)
SIUM   (K)                           SULFATE (SO4)      402.0       8.370
                                    FLUORIDE   (F)
                               PHOSPHATE(PO4 AS P)
                                NO3+NO2 (TOT AS N)
              ______     ______                        ______     ______
SUM CATIONS    144.3      8.019        SUM ANIONS       416.6       8.610

         LABORATORY PH       5.97     TOT HARDNESS(MG/L-CACO3)    401
D WATER TEMPERATURE (C)              TOT ALKALINITY(MG/L-CACO3)    12
-DISS. IONS MEAS.(MG/L)              LABORATORY TURBIDITY (NTU)
 CONDUCTIVITY-UMHOS-25C     814.0       SODIUM ADSORPTION RATIO

             A D D I T I O N A L   P A R A M E T E R S
MIUM, TR (MG/L AS CD)       .31      COPPER,TR (MG/L AS CU)      6.
 ZINC,TR (MG/L AS ZN)     42.          IRON,TR (MG/L AS FE)     94.
MIUM,DISS(MG/L AS CD)       .13    IRON,FERROUS,DISS (MG/L)      0.2
PER, DISS(MG/L AS CU)       .26    ZINC, DISS(MG/L AS ZN)         .18




ARKS: DFW&P FLOOD SAMPLING

LANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER LITER
 CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=SUSPENDED
= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERABLE
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
PLE NO           SAMPLER  KH      HANDLING 3210    ANALYST  DME    LAB  WQBH
PLETED 06-09-81  COMPUTER RUN 06/16/81  DATA 0975/PROG 0876 FUND 6053
D DEV. ION BALANCE  2.70      CA    MG    NA     K    CL   SO4  HCO3  CO3  NO3
SMENT      NPDES            74.0 26.0  0.0   0.0   0.0  97.2   2.8  0.0  0.0
LC. MEQ/L= INSUFFICIENT DATA                                          81W0863
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STATE HEALTH DEPT.           WATER QUALITY BUREAU                  HELENA, M

              STATE   MONTANA
          LAT.-LONG.  462248N 112 325W                               COUNTY  JE
        STATION CODE                                        SAMPLE LOCATION  7
        DATE SAMPLED  05-22-81                              ANALYSIS NUMBER  81
        TIME SAMPLED                                         DRAINAGE BASIN  41
      METHOD SAMPLED  GRAB                                  WATER FLOW RATE
       SAMPLE SOURCE  STREAM                     FLOW MEASUREMENT METHOD
           WATER USE  MULTIPLE                 ALTITUDE OF LAND SURFACE
          AQUIFER(S)                          TOTAL WELL DEPTH BELOW LS
          SAMPLED BY  DFWP                    SWL ABOVE(+) OR BELOW LS
                                             SAMPLE DEPTH BELOW SURFACE

           SAMPLING SITE: SPRING CR ABOVE CORBIN CR

                     MG/L        MEQ/L
  ALCIUM  (CA)       80.1        3.997                                MG/L
  ESIUM   (MG)       12.9        1.061    BICARBONATE(HCO3)           26.2
  ODIUM   (NA)                              CARBONATE (CO3)            0.0
  SSIUM    (K)                               CHLORIDE  (CL)
                                              SULFATE (SO4)          231.0
                                             FLUORIDE   (F)
                                        PHOSPHATE(PO4 AS P)
                                         NO3+NO2 (TOT AS N)

  SUM CATIONS        93.0        5.058
                                                SUM ANIONS           257.2

              LABORATORY PH       6.62        TOT HARDNESS(MG/L-CACO3)
 D WATER TEMPERATURE (C)                    TOT ALKALINITY(MG/L-CACO3)
 -DISS. IONS MEAS.(MG/L)                    LABORATORY TURBIDITY (NTU)
  CONDUCTIVITY-UMHOS-25C        513.0         SODIUM ADSORPTION RATIO

                     A D D I T I O N A L    P A R A M E T E R S
 CADMIUM, TR (MG/L AS CD)         .08           COPPER,TR (MG/L AS CU)
     ZINC,TR (MG/L AS ZN)      10.                IRON,TR (MG/L AS FE)
 CADMIUM,DISS(MG/L AS CD)         .005   IRON,FERROUS,DISS (MG/L)
 COPPER, DISS(MG/L AS CU)         .02    ZINC, DISS(MG/L AS ZN)

REMARKS: DFW&P FLOOD SAMPLING

EXPLANATION: MG/L=MILLIGRAMS PER LITER  MEQ/L=MILLIEQUIVILENTS PER
ALL CONSTITUENTS DISSOLVED (DISS) EXCEPT AS NOTED. TOT=TOTAL SUSP=S
(M)= MEASURED(R)=REPORTED (E)=ESTIMATED M=METERS TR=TOTAL RECOVERAB
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
SAMPLE NO              SAMPLER  KH      HANDLING 3210   ANALYST  DME   L
COMPLETED 06-09-81  COMPUTER RUN 06/16/81  DATA 0975/PROG 0876 FUND
STND DEV. ION BALANCE  1.07      CA    MG    NA    K    CL   SO4  HCO3
SEGMENT       MPDES            79.0  21.0   0.0   0.0  0.0  91.8   8.2
ALC. MEQ/L= INSUFFICIENT DATA
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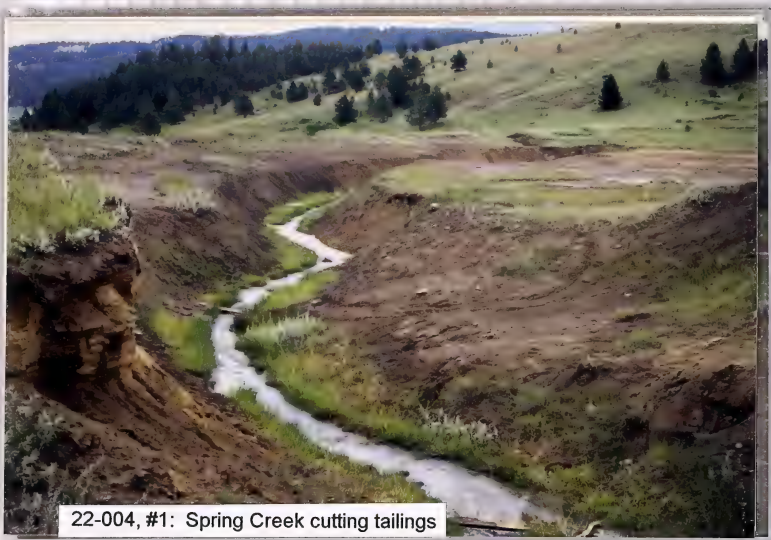
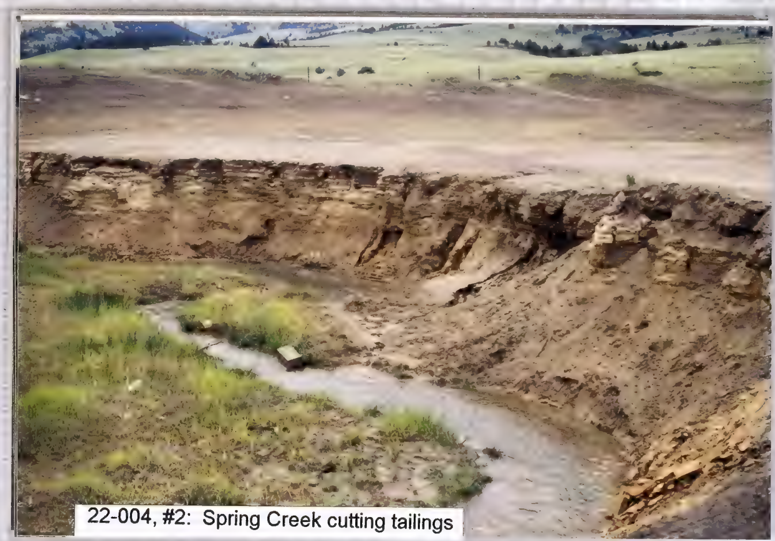
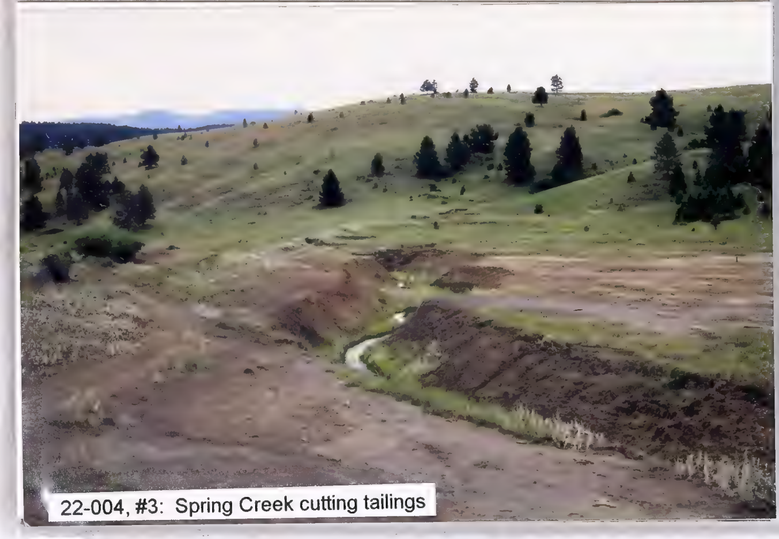
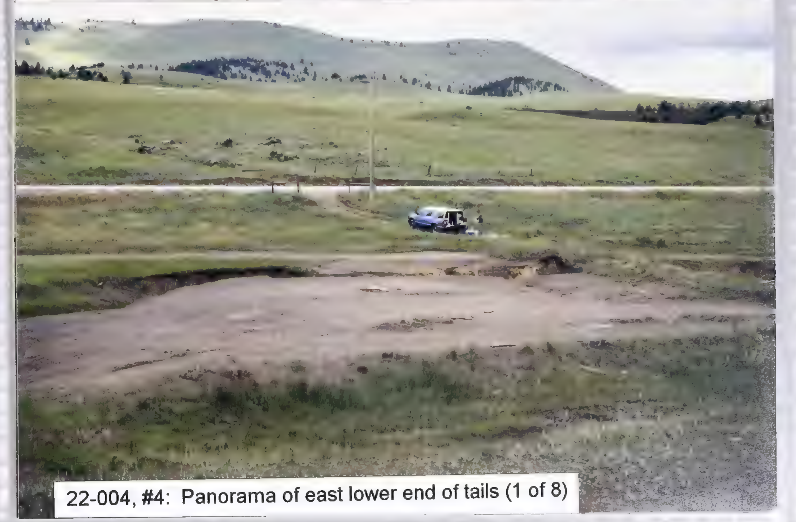

22-004, #1: Spring Creek cutting tailings

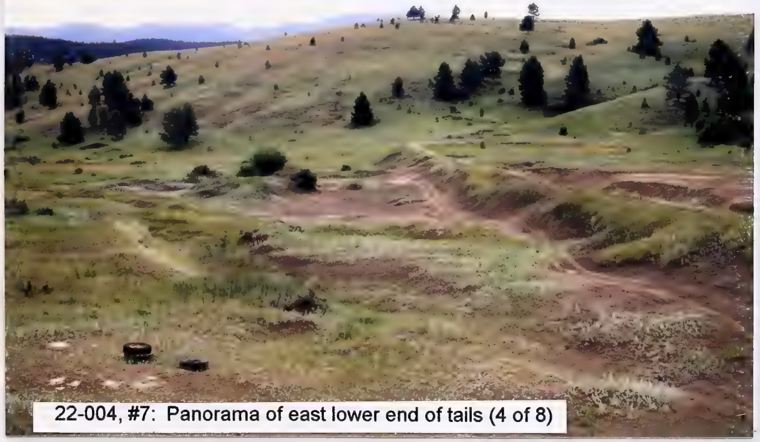

22-004, #2: Spring Creek cutting tailings


22-004, #3: Spring Creek cutting tailings


22-004, #4: Panorama of east lower end of tails (1 of 8)

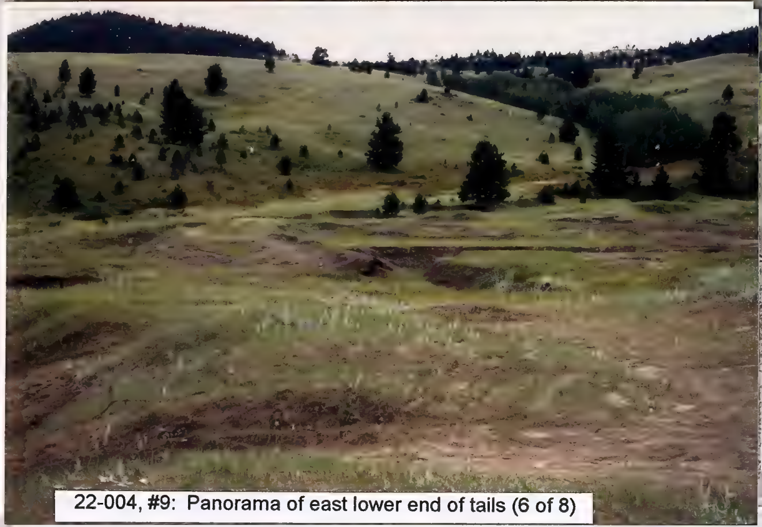
22-004, #5: Panorama of east lower end of tails (2 of 8)

22-004, #6: Panorama of east lower end of tails (3 of 8)

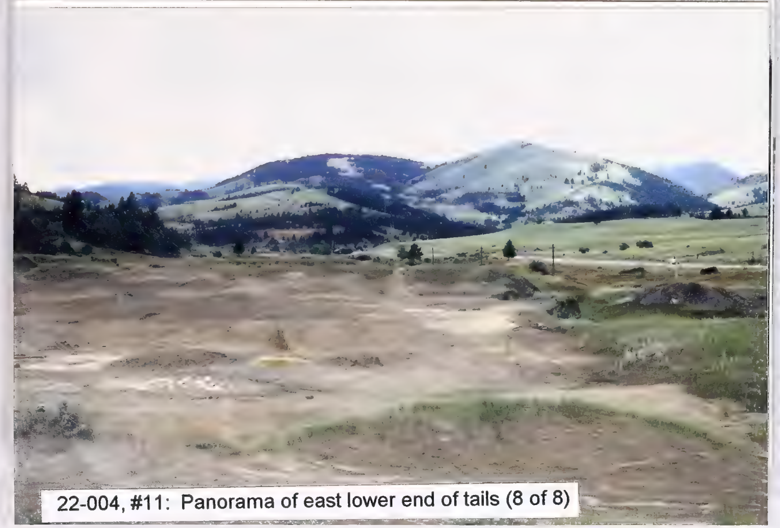


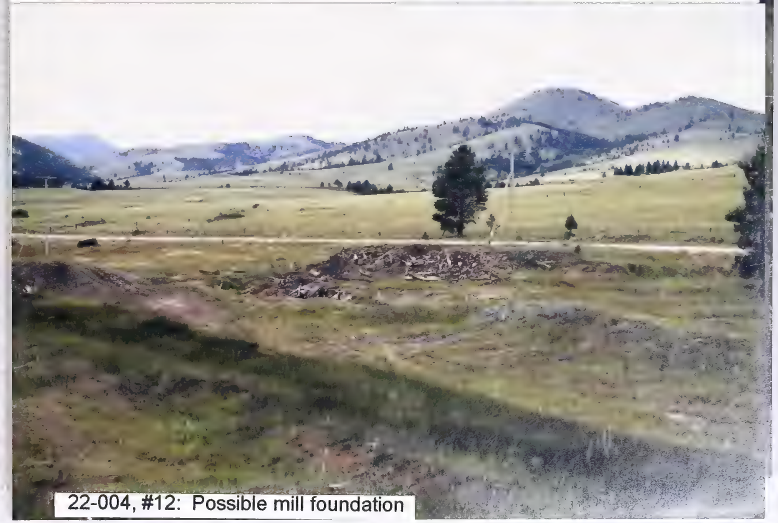
22-004, #7: Panorama of east lower end of tails (4 of 8)

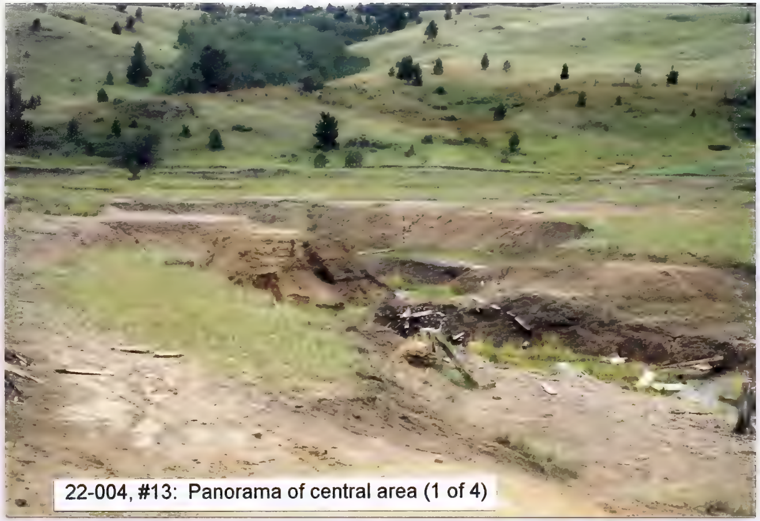
22-004, #8: Panorama of east lower end of tails (5 of 8)

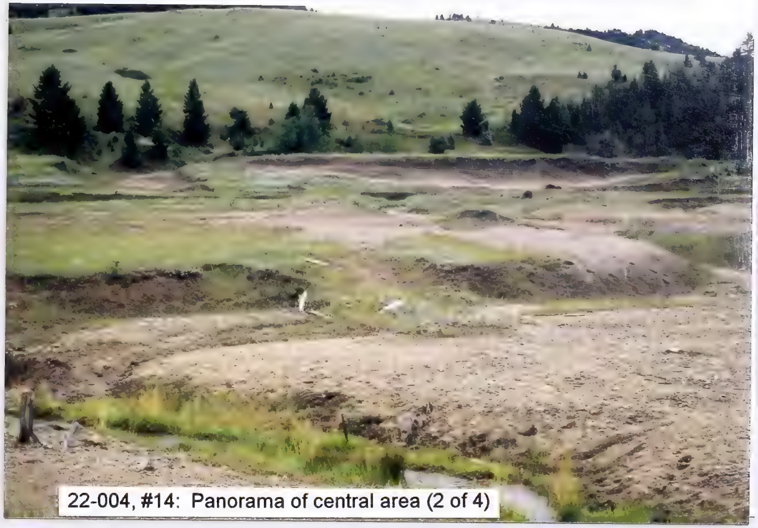

22-004, #9: Panorama of east lower end of tails (6 of 8)

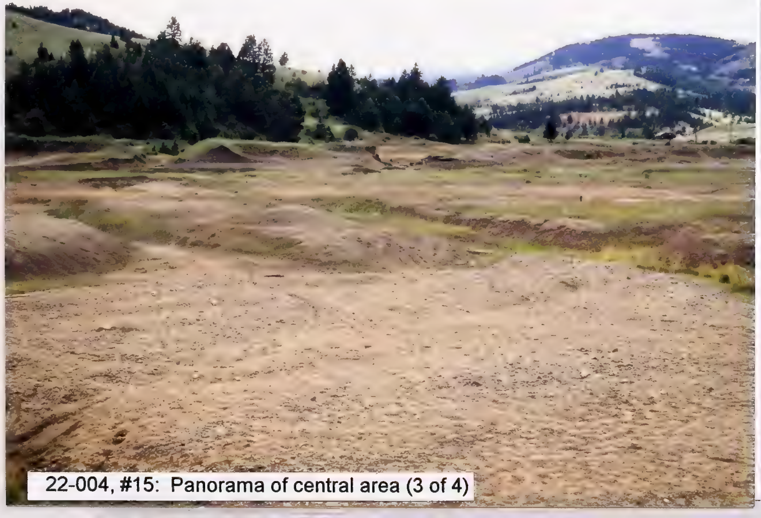
22-004, #10: Panorama of east lower end of tails (7 of 8)

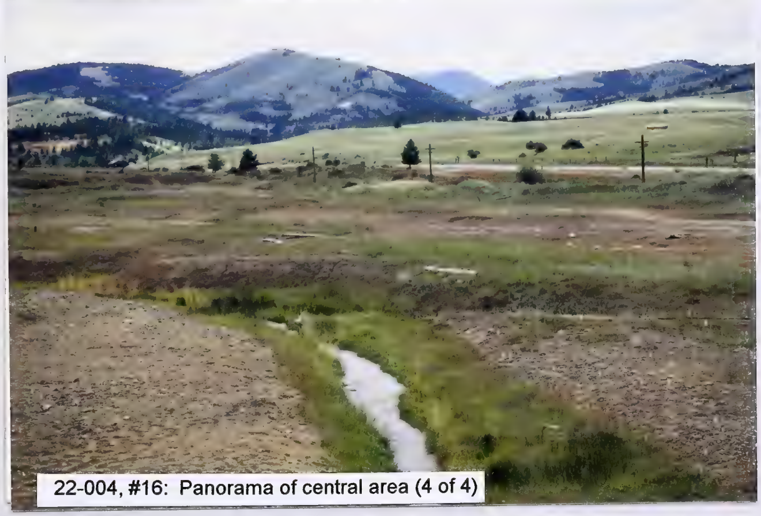

22-004, #11: Panorama of east lower end of tails (8 of 8)

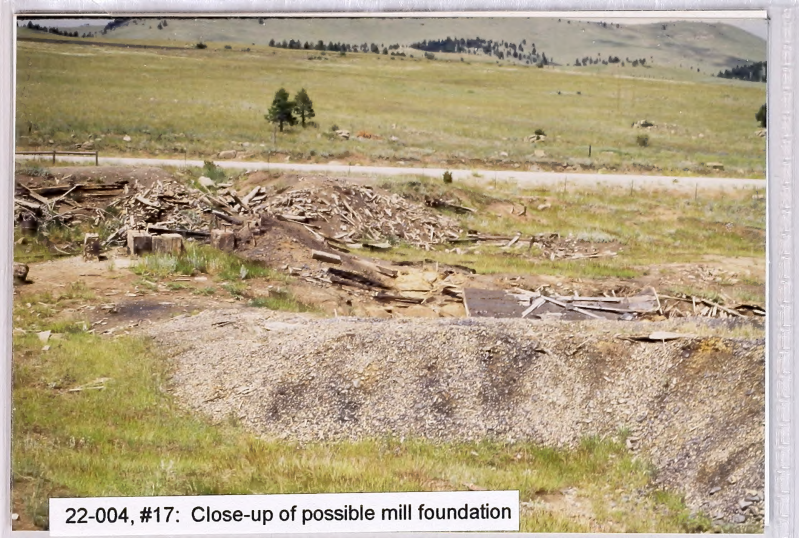

22-004, #12: Possible mill foundation


22-004, #13: Panorama of central area (1 of 4)

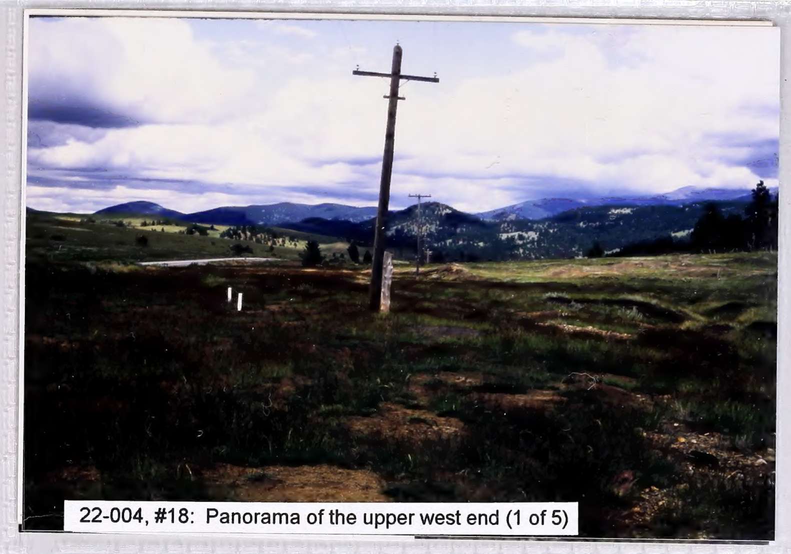

22-004, #14: Panorama of central area (2 of 4)


22-004, #15: Panorama of central area (3 of 4)

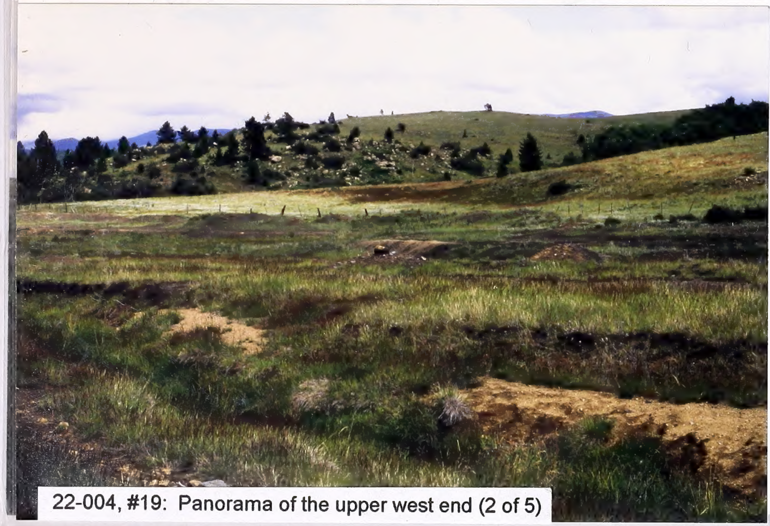

22-004, #16: Panorama of central area (4 of 4)



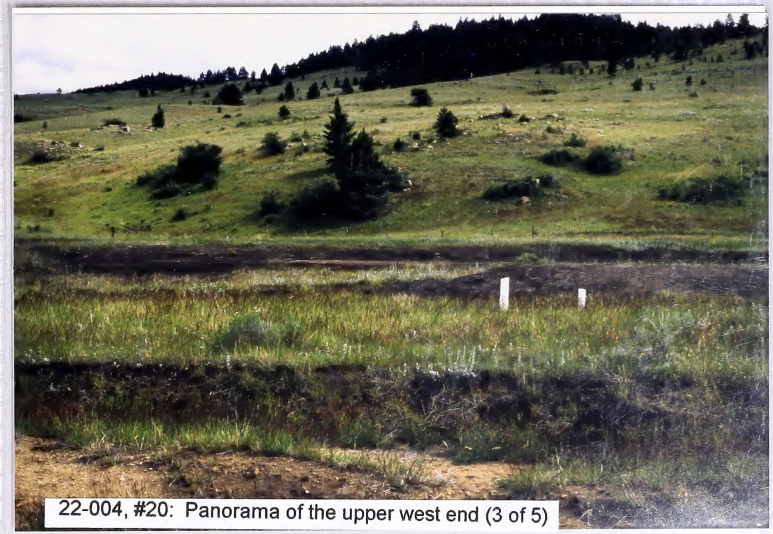
22-004, #17: Close-up of possible mill foundation



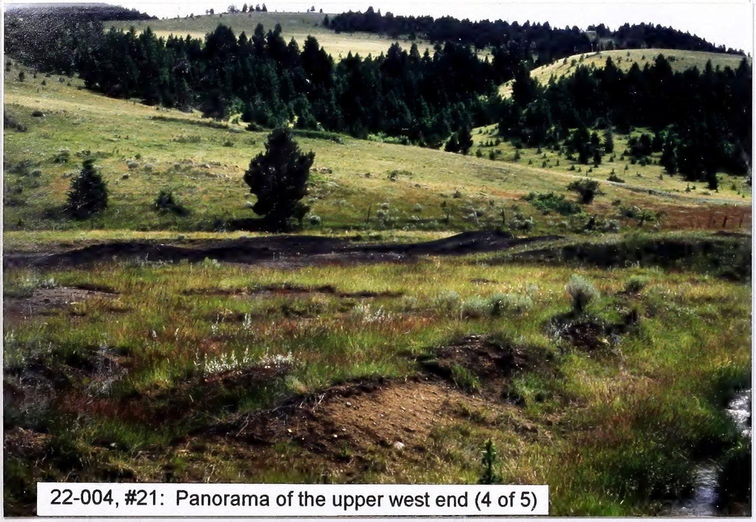
22-004, #18: Panorama of the upper west end (1 of 5)



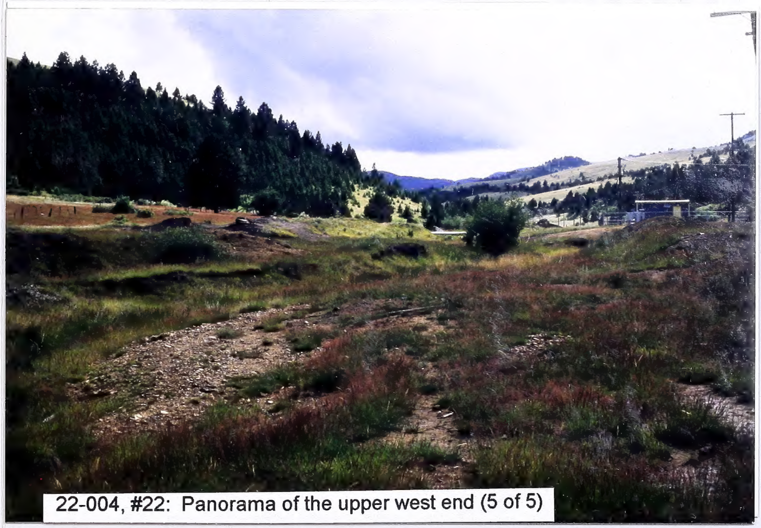
22-004, #19: Panorama of the upper west end (2 of 5)



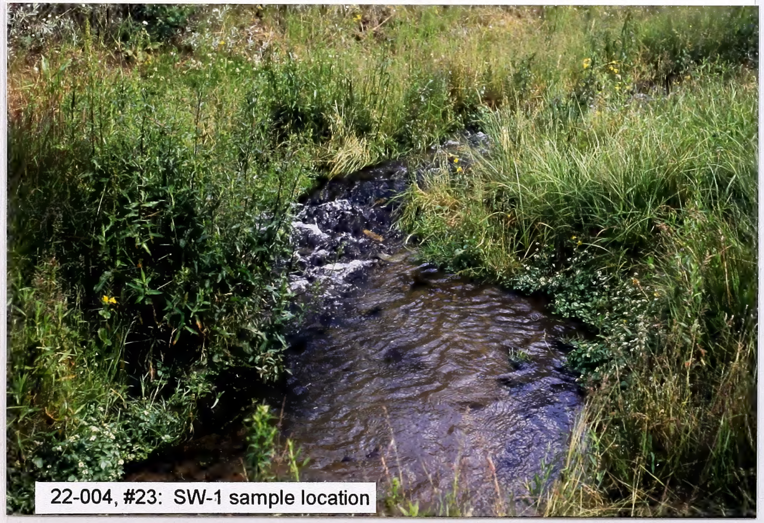
22-004, #20: Panorama of the upper west end (3 of 5)



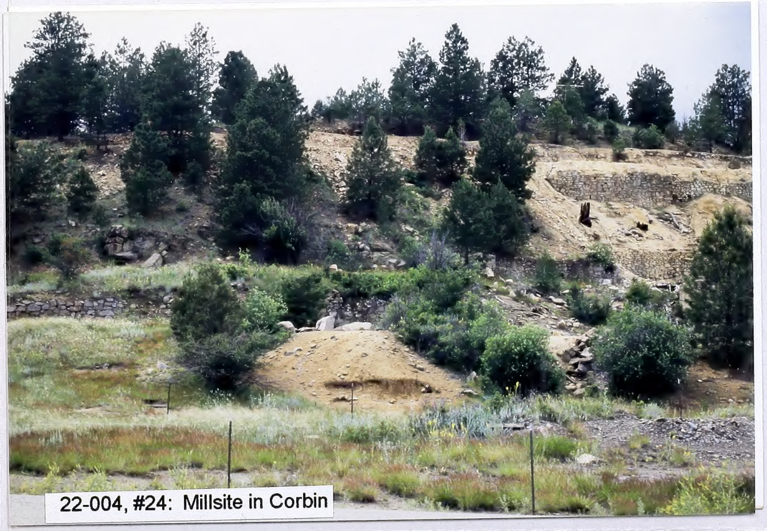
22-004, #21: Panorama of the upper west end (4 of 5)



22-004, #22: Panorama of the upper west end (5 of 5)



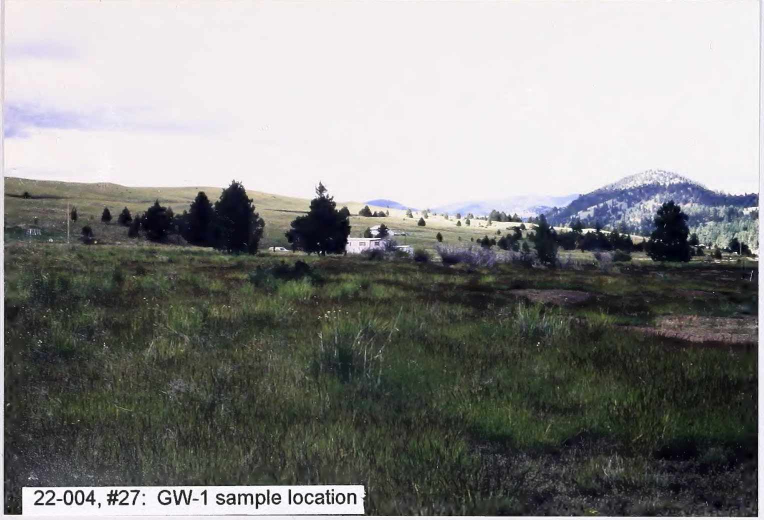
22-004, #23: SW-1 sample location



22-004, #24: Millsite in Corbin

22-004, #25: Millsite in Corbin

22-004, #26: SW-2 sample location



22-004, #27: GW-1 sample location